ERDC/CHL TR-02-8

Coastal and Hydraulics Laboratory

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Biscayne Bay Field Data

Volume 1, Main Text

Robert McAdory, Thad C. Pratt, Martin T. Hebler,
Timothy L. Fagerburg, and Richard Curry

July 2002

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Final report

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Preface

The field investigation reported herein was conducted by the Biscayne National Park (BNP) in partnership with the Coastal and Hydraulics Laboratory (CHL) of the U.S. Army Engineer Research and Development Center (ERDC) located at the Waterways Experiment Station (WES). CHL participation was under the sponsorship of the U.S. Army Engineer District, Jacksonville (SAJ), and their partner the Miami-Dade Department of Environmental Resources Management (DERM). The purpose of the field investigation was to provide data in support of a companion study whose purpose was to develop a numerical hydrodynamic and salinity model of Biscayne Bay. The field data collection efforts were conducted from June 1997 to August 1998 and were funded by SAJ and DERM. CHL contributions were under the management of Mr. Michael Choate of SAJ. CHL liaison was Mr. Thad C. Pratt of the Hydraulic Analysis Group (HAG), Tidal Hydraulics Branch (THB), CHL.

The CHL work was performed under the general supervision of Dr. James R. Houston, Director, CHL, Messrs. Richard A. Sager and Charles C. Calhoun, Assistant Directors, CHL, Dr. William H. McAnally, Chief, Estuaries and Hydrosciences Division, Dr. Robert McAdory, Chief, THB, and Mr. Timothy L. Fagerburg, Group Leader, HAG. Messrs. Pratt and Fagerburg designed the data collection program in concert with BNP. Mrs. Clara J. Coleman and Messrs. Pratt, Martin T. Hebler, Howard A. Benson, and Terry N. Waller, and Dr. McAdory performed data reduction. Mmes. Coleman, Darla C. McVan, Kathy S. Trest, Donna L. Richey, and Maria Soraya Sarruff and Messrs. Fagerburg and John Cartwright assisted in the preparation of this report. Dr. McAdory and Mr. Pratt wrote the report; Mr. Fagerburg wrote Appendix A; Dr. Ned Smith and Mr. Patrick Pitts, Harbor Branch Oceanographic Institute, wrote Appendix B; and Mr. Richard Curry, BNP, wrote Appendix C; Mr. Fagerburg and Dr. McAdory wrote Appendix D; Dr. McAdory wrote Appendix E; and Mr. Hebler and Dr. McAdory were responsible for the processed data sets available from ERDC or SAJ. Mr. Curry led the BNP team and was assisted by Mr. Max Flandorfer. Mr. Tim McIntosh of DERM provided Miami-Dade County's water quality monitoring program ("Bay Run") salinity data. Ms. Emily Hopkins of the South Florida Water Management District (SFWMD) provided additional water-surface elevation data. Ms. Angela Chong and Messrs. Muluneh Inru and Emile Damisse of SFWMD provided canal flow data from the DBHYDRO database. Mr. Matt Davis, SFWMD, was instrumental in the acquisition of flows for S197. Dr. Joe Boyer of Florida International University and Dr. Zaki Moustafa of SFWMD provided Dr. Boyer's Biscayne Bay salinity

data. The report benefited from the comments of Messrs. Curry, Mitch Granat, SAJ, and Ms. Gwen Burzycki, DERM.

At the time of publication of this report, Mr. Thomas W. Richardson was Director of CHL and Dr. William D. Martin was Deputy Director of CHL.

Dr. James R. Houston was Director of ERDC and COL John W. Morris III, EN, was Commander and Executive Director of ERDC.

Conversion Factors, Non-SI To SI Units of Measurement

Non-SI units of measurement used in this report can be converted to SI units as follows:

Multiply	By	To Obtain
cubic feet	0.02831685	cubic meters
cubic feet per second	0.02831685	meters per second
degree (angle)	0.1745329	radians
feet	0.3048	meters
feet per second	0.3048	meters per second
gallons	0.03785412	cubic meters
inches	2.54	centimeters
miles (U.S. statute)	1.609347	kilometers
square feet	0.09290304	square meters
square inches	0.0006451600	square meters

1 Introduction

Background

Biscayne Bay, located on the southeast coast of Florida, is a shallow, subtropical marine lagoon with substantial estuarine characteristics, especially along its western shoreline. It extends approximately 96 km (60 miles) from north of Baker's Haulover Inlet south to Jewfish Creek adjoining Blackwater Bay on the eastern edge of Florida Bay. Biscayne Bay varies from less than one mile[1] to approximately eight miles in width. It is bordered on the west by the South Florida mainland and on the east by a series of, primarily, coral islands and shallow, vegetated mud banks. Figure 1 locates Biscayne Bay. Cantillo et al. (2000) and Bellmund, Browder, and Alspach (1999) provide good discussions of the Bay.

Biscayne Bay is important as a tourist, commercial fishing, and recreational area. The U.S. Army Engineer District, Jacksonville (SAJ), and local sponsors and partners such as the Miami-Dade Department of Environmental Resources Management (DERM), Biscayne National Park (BNP), and the South Florida Water Management District (SFWMD), therefore, are interested in developing numerical models and data sets that can aid in the study and management of Biscayne Bay circulation, salinity, and water quality (SAJ 1995). The study of circulation, salinity, and water quality patterns in a system such as Biscayne Bay, however, is a complex issue. Physical processes that impact the water quality within the system vary both spatially and temporally. Bathymetry and geometry of the navigation channels, interconnecting canals and inlets, astronomically induced tide currents, wind-induced currents, ocean circulation, and freshwater inflow are also major factors that influence Bay circulation and salinity patterns. This field investigation was proposed and undertaken primarily to obtain information on the existing hydrodynamics and salinity of the Bay to aid in the further assessment of the impact of these and other features on the system.

[1] A table of factors for converting non-SI units of measurement to SI units is presented on page xii.

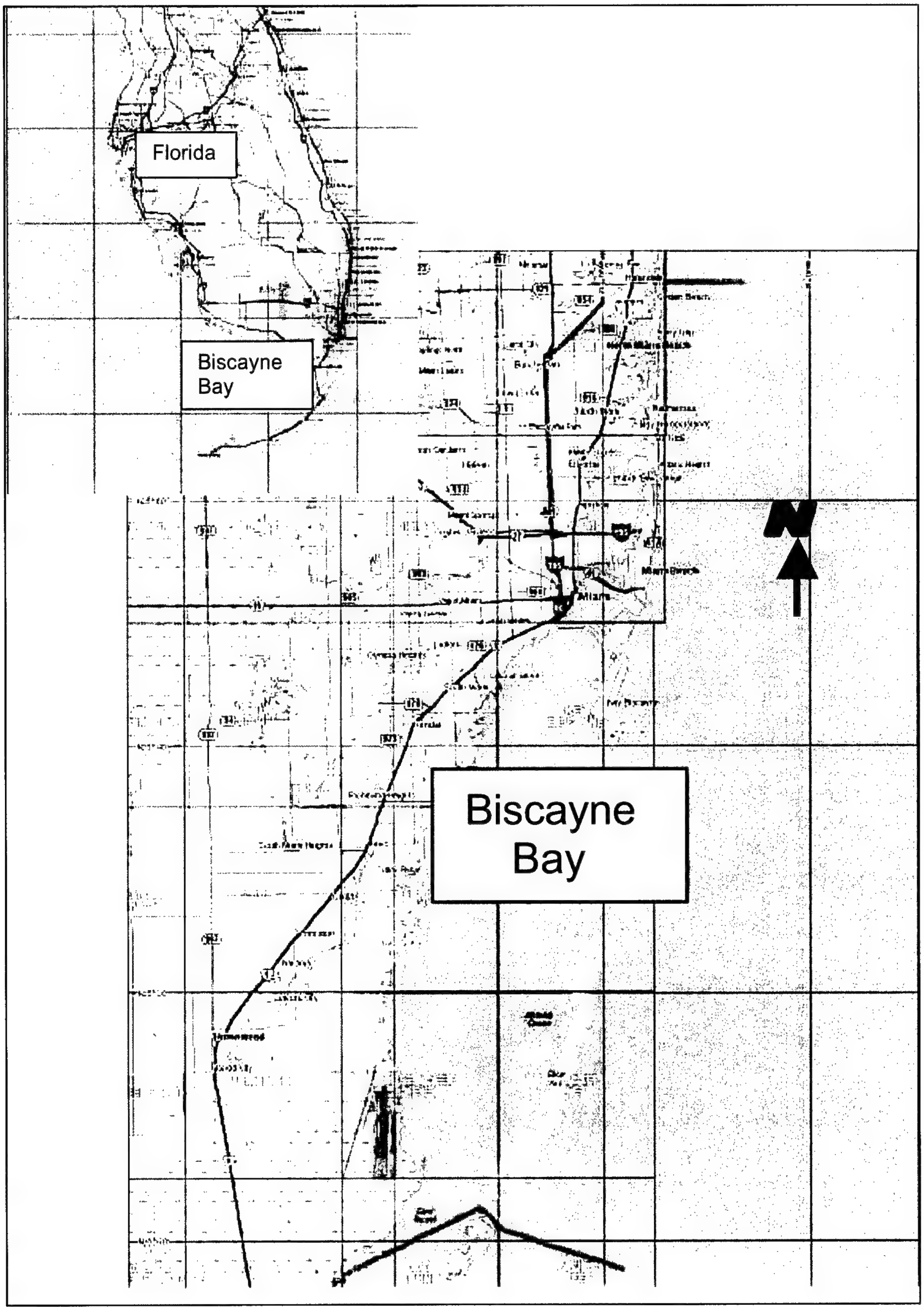

Figure 1. Biscayne Bay locator maps

Purpose

More explicitly, the purpose of the field data collection program was to provide (a) hydrodynamic results such as current velocities, cross-sectional discharges, and water levels and (b) salinity and meteorological measurements during long-term monitoring and short-term intensive surveys. These data were collected for use in the development and verification of a two-dimensional numerical hydrodynamic and salinity model of the study area, as well as to provide a large data set (water-surface elevations, current velocities, salinities, discharges, for example) for general use in understanding the Bay. The purpose of the numerical hydrodynamic and salinity modeling is to develop a tool for use in understanding and assessing the impact of changing freshwater inflow on Bay salinity.

Approach

To obtain the necessary data in Biscayne Bay a long-term monitoring program was conducted over a 12- to 15-month period (June 1997 to August 1998), and two short-term intensive data collection periods (14-16 October 1997 and 26-28 February 1998) were undertaken to examine seasonal variation of cross-sectional discharges (e.g., through inlets). The long-term monitoring equipment used to collect the data consisted of five bottom-mounted Acoustic Doppler Profiler (ADP) current velocity meters, 12 conductivity, temperature, and depth recorders (CTD), and one meteorological station within the study area. Salinity is a mathematically derived product of the CTD conductivity and temperature measurements. The short-term intensive surveys were the collection of cross-sectional current speed and direction measurements using boat-mounted Acoustic Doppler Current Profiler (ADCP) instruments. During each of the two three-day survey periods, each of the 27 transects was traversed approximately nine times over an eight-hour period (nominally hourly). Three boats, surveying three of the 27 inlets or interior channels per day, were required to complete each survey in three days.

BNP and the Coastal and Hydraulics Laboratory (CHL), of the U.S. Army Engineer Research and Development Center (ERDC) located at the Waterways Experiment Station (WES), carried out the data collection program. CHL also gathered canal discharge data of freshwater and relevant information concerning them from the U. S. Geological Survey (USGS) and the SFWMD. These data were processed for use in the modeling exercise. Additionally, temperature, dissolved oxygen, and other data sets were obtained during the BNP/CHL long-term data collection effort. Only the BNP/CHL data sets relevant to the hydrodynamic and salinity numerical modeling of the system are discussed at length in this report, though representative plots of the additional BNP/CHL data (such as temperature and dissolved oxygen (DO)) are presented among the plates herein. Additional data, such as the BNP salinity profile data taken with a Sea-Bird Electronics CTD instrument ("Sea-Bird" data) (Sea-Bird Electronics 1995) during CTD servicing at the CTD deployment sites and the Miami-Dade County

surface water quality monitoring program data ("Bay Run" data) (DERM, various), are utilized where appropriate. Additional data, such as tide levels from the SFWMD (Hopkins)[1] and Biscayne Bay salinities from Dr. Joe Boyer of Florida International University (Boyer 2000) were acquired and provided for the modeling effort.

CHL personnel assisted BNP in the initial installation of the long-term monitoring equipment. All subsequent servicing, calibration, and data retrieval activities related to the long-term monitoring equipment were performed by BNP. Retrieved data were transmitted to CHL for reduction into ASCI formats suitable for use by end users. The two short-term intensive data collection efforts were performed jointly by CHL and BNP. A DERM representative assisted during the February effort. These data were carried back to CHL for reduction after the conclusion of each intensive effort.

This report contains descriptions of the field effort and the data obtained. With the exception of the intensive survey data collection efforts, most descriptions of the field effort are presented as inferred from the data, the known operating characteristics of the long-term monitoring instruments employed, and discussions with BNP and CHL personnel. For example, meter-servicing events can be deduced from the starting and ending points of the CTD data. When data were downloaded, BNP reset the meter memory to erase the downloaded data from the instrument itself so as to provide maximum instrument memory availability, in preparation for more data recording, etc. Servicing times can then be inferred from these hard stops in the data and the nature of the recorded values themselves. In addition to the included sample and illustrative plots of the data, some analysis and assessment of the data are presented in the body of the report and in the appendices.

The complete data set, including raw data files, reduced subsets of the data sets, and adjusted data sets, is available from ERDC or SAJ. Raw files are those from the instruments. Reduced data set files are those that contain particular quantities, such as salinity for example, that have been redacted from the raw files for ease of use. The adjusted data set files involve data (the water levels) that have been adjusted for datum, etc., as discussed in subsequent chapters.

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[1] Hopkins, E. (2000). South Florida Water Management District, West Palm Beach, FL. Personal Communication.

2 Data Collection: Program and Equipment

Data Collection Program

The field effort included long-term monitoring of ADP velocity profiles at five locations, meteorological data, and CTD water level and salinity data at twelve locations. Additionally, the effort included short-term intensive collection of ADCP current speed and direction data at 27 inlets or interior channels in Biscayne Bay. The long-term data were collected by BNP, and the short-term intensive data were collected jointly by BNP and CHL. CHL personnel assisted in the initial deployment of the long-term monitoring equipment and reduced and processed all of the data. Photographs and discussion of the instruments are presented in the Data Collection Equipment section of this chapter. Appendix A provides further discussion of data collection instrumentation.

Long-term monitoring

Locations of the long-term monitoring instruments were determined from discussions with the numerical modelers and study sponsors and participants. CHL and BNP undertook a reconnaissance trip prior to the field equipment deployment effort to determine final locations of the long-term monitoring equipment and to examine the inlets and channels to be monitored for the short-term intensive surveys. Later, BNP personnel placed bottom "pins" at the sites (except for CTD Station 10) to which the long-term instruments would be secured later. Finally, CHL personnel accompanied BNP to deploy the instruments and survey (vertically) the CTD sites.

A meteorological station was deployed off Convoy Point at BNP for monitoring wind and weather patterns (Figure 2, Figure 3, and Table 1). The parameters monitored included wind speed and direction, precipitation, temperature, relative humidity, solar radiation, evaporation, and barometric pressure. Precipitation, evaporation, wind velocity, and barometric pressure (for use in correcting the CTD water-surface elevation data for atmospheric pressure) were the most relevant weather data for model development.

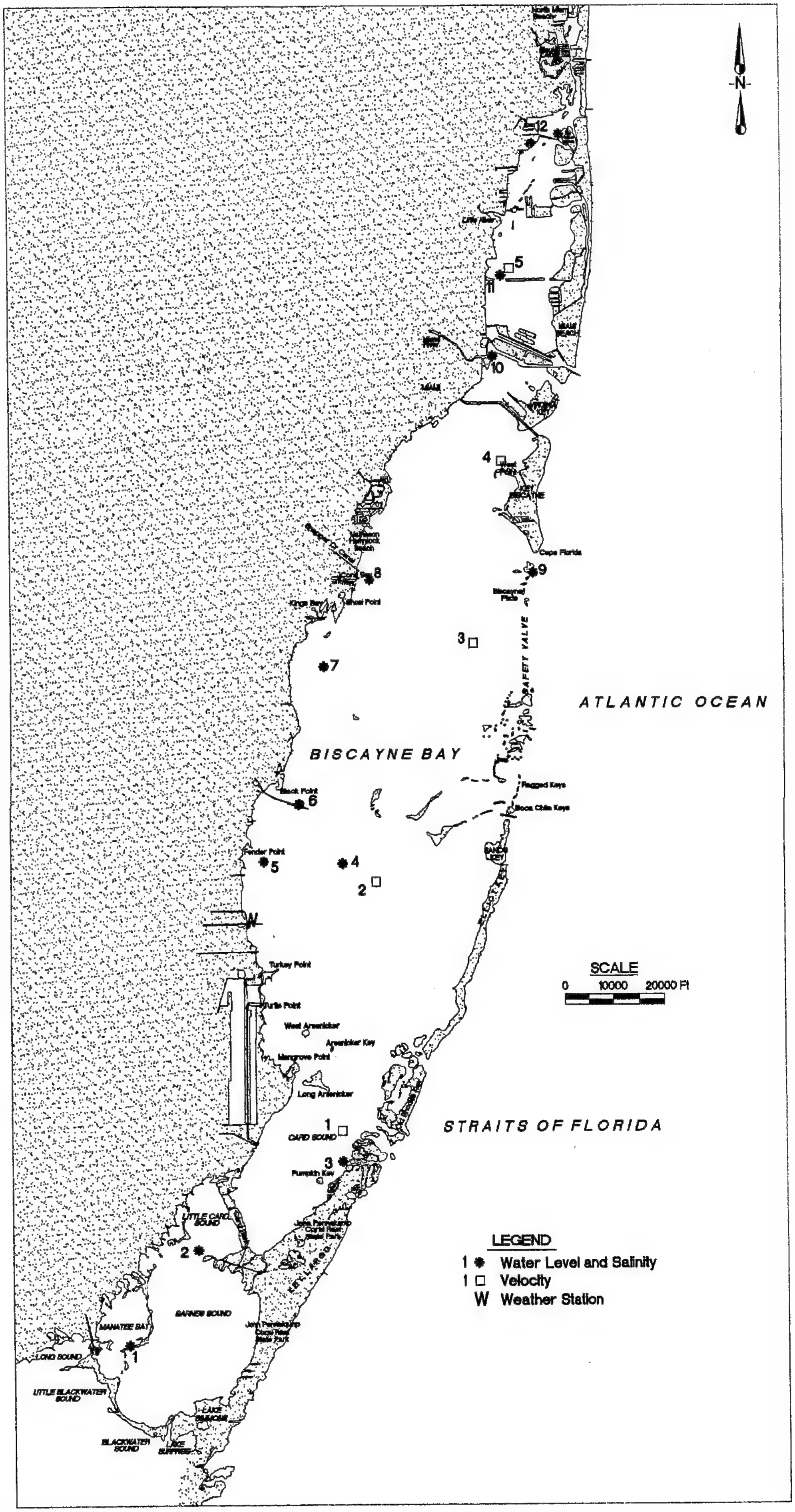


Figure 2. Instrument location map

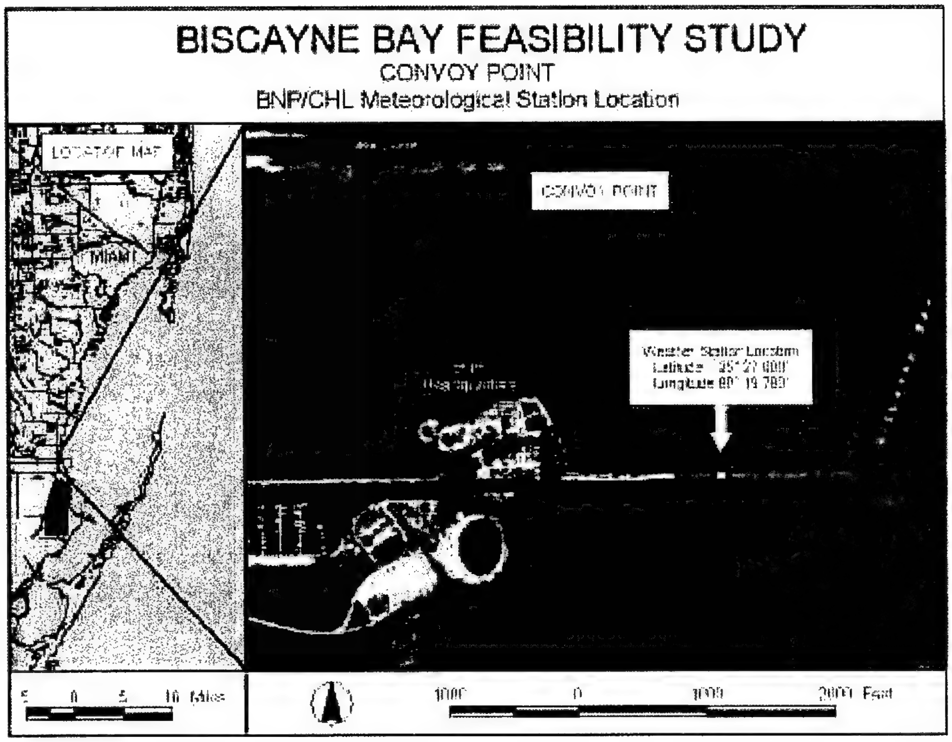
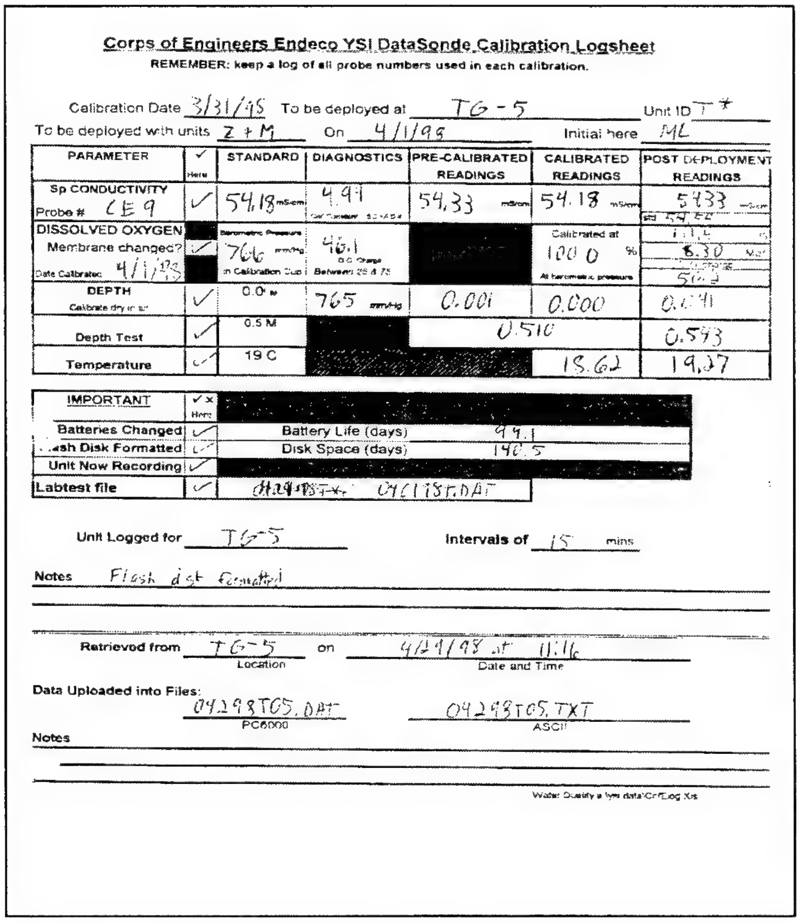


Figure 3. Location map for study meteorology station (Courtesy of Tim McIntosh, DERM)

Bottom-mounted ADP's were deployed at five locations beginning in the southern portion of the Bay at Card Sound, near Angelfish Creek (ADP1). (Figure 2 and Table 1: ADP velocity stations are indicated in Figure 2 by numbered squares.) The locations extended north into North Bay, near the Julia Tuttle Causeway (ADP5). The ADP's provided long-term current speed and direction profiles at the five locations. Other data, such as water-surface elevation (with no vertical survey) and temperature, are also available from these ADP's.

The twelve CTD sensors were deployed near the bottom at strategic locations within the Bay for long-term water level and salinity (by calculation from conductivity and temperature measurements) data recording. These CTD instruments also provided dissolved oxygen and pH data. Figure 2 shows the approximate locations of these instruments, and Table 1 provides the exact locations during the survey period.

BNP personnel undertook trips to the deployment sites to retrieve the instruments for servicing, to deploy fresh instruments, and to download data. Park personnel, under the direction of Mr. Richard Curry, also performed calibrations and checks of all equipment at BNP and took site deployment salinity profile data (the Sea-Bird data) during the CTD service trips. A sample calibration sheet is included as Figure 4.



Corps of Engineers Endeco YSI DataSonde Calibration Logsheet

REMEMBER: keep a log of all probe numbers used in each calibration.

Calibration Date 3/31/95 To be deployed at TG-5 Unit ID T*

To be deployed with units Z + M On 4/1/98 Initial here ML

PARAMETER	✓ Here	STANDARD	DIAGNOSTICS	PRE-CALIBRATED READINGS	CALIBRATED READINGS	POST DEPLOYMENT READINGS
Sp CONDUCTIVITY Probe # CE9	✓	54.18 mS/cm	4.94	54.33 mS/cm	54.18 mS/cm	5433 mS/cm
DISSOLVED OXYGEN Membrane changed? ✓ Date Calibrated 4/1/98		Barometric Pressure 766 mm/Hg in Calibration Cup	46.1 D.O. Charge Between 25 & 75		Calibrated at 100.0 % At barometric pressure	8.30
DEPTH Calibrate dry in air	✓	0.0 m	765 mm/Hg	0.001	0.000	0.041
Depth Test	✓	0.5 M		0.510		0.593
Temperature	✓	19 C			15.62	19.37

IMPORTANT	✓ x Here		
Batteries Changed	✓	Battery Life (days)	94.1
Flash Disk Formatted	✓	Disk Space (days)	140.5
Unit Now Recording	✓		
Labtest file	✓	040198TX 040198T.DAT	

Unit Logged for TG-5 Intervals of 15 mins

Notes Flash disk formatted

Retrieved from TG-5 (Location) on 4/29/98 at 11:16 (Date and Time)

Data Uploaded into Files: 04298T05.DAT (PC6000) 04298T05.TXT (ASCII)

Notes

Water Quality a lyes data\Cr\Log.Xls

Figure 4. Sample BNP data log sheet (Courtesy Max Flanderfer, BNP)

Short-term intensive surveys

Two intensive surveys (14-16 October 1997 and 26-28 February 1998) were conducted to monitor seasonal variations in discharges across various inlet and other Bay cross-sections. During each intensive survey, boat-mounted ADCP's were used to obtain current speed and direction data at 27 inlets or channels (transects) (Figure 5) over a, typically, eight-hour period. Tables 2-4 provide locations for the transect sites, the number of crossings at each location, and the timing of the effort for each intensive survey period. Transect 9 was, with Transect 8, originally planned to be part of the survey of the Safety Valve (see Figure 5). At site, however, the two were combined into one long transect (Transect 8). The total number of transect locations remained at 27, however, since Transect 121 was added at site. Changes such as these were made to accommodate the realities of the field conditions and aid in obtaining the most appropriate data set. Since the file systems were set up as part of the mobilization effort, field changes occasionally result in numbering anomalies (such as "no Transect 9" and "Transect 121"). During a given day's data collection, the hourly surveys for the various transects were approximately synoptic.

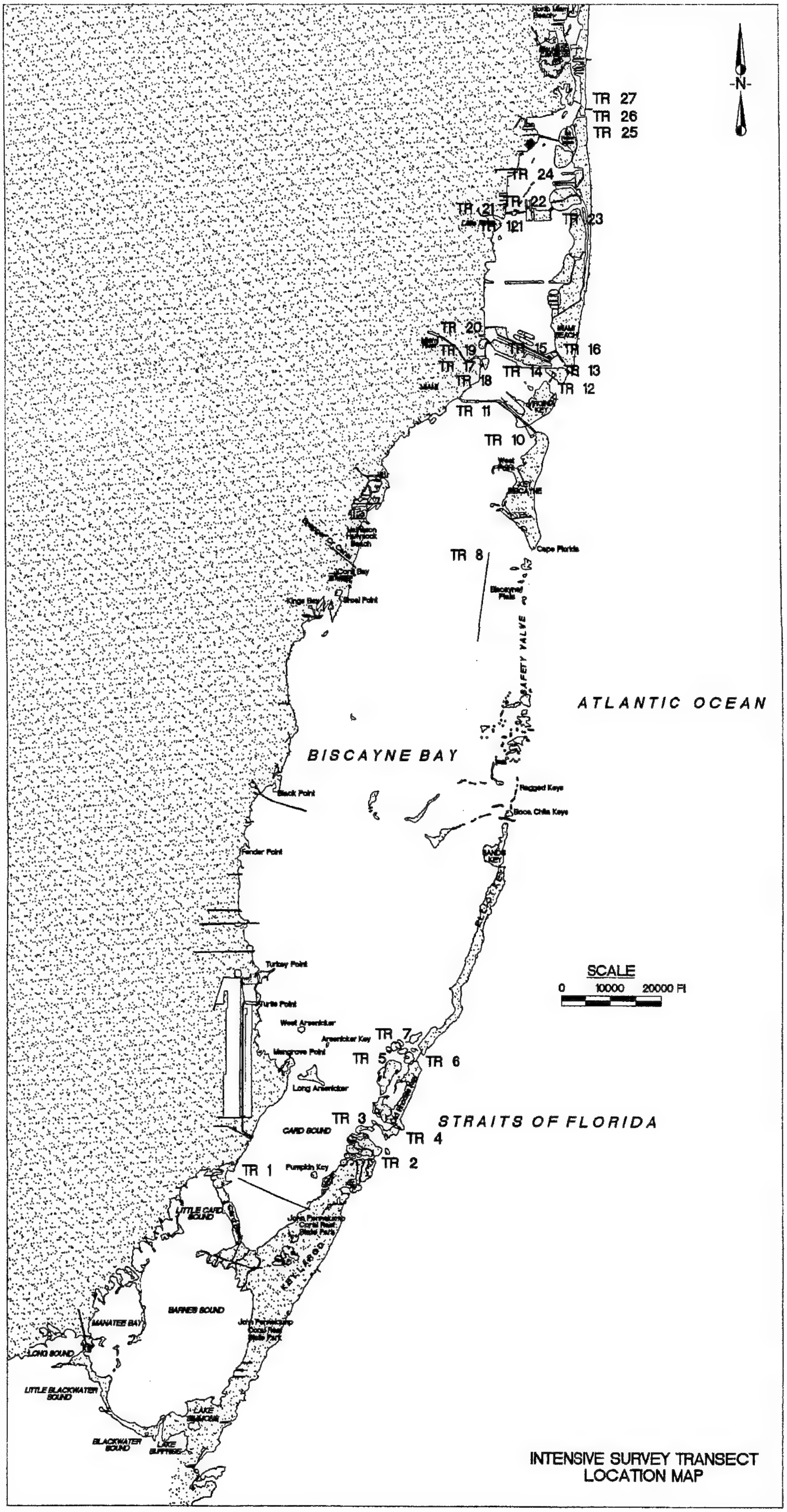


Figure 5. Transect location map (TR = Transect)

Discharges through these cross-sections, in volume (cubic feet) of water per second (cfs) based on the velocity measurements, are part of the ADCP output. These discharges are the portion of the ADCP data that are most relevant for model development. Fair weather conditions during the surveys were conducive to collecting high-quality data. CHL and BNP conducted each survey as a joint operation and, for safety reasons, each survey was conducted only during daylight hours.

Data collection procedures

The long-term data collection instruments (ADP, CTD, and weather station) were deployed at the locations shown in Figures 2 and 3 and remained in place for the 12- to 15-month period. (Though the nominal data collection period was twelve months, some instrument locations were occupied for longer periods. Some CTD instruments continue to be deployed by BNP within the Park boundary at this writing. This report focuses on data taken between 1 June 1997 and 30 June 1998.) CHL recommended a twenty-one-day servicing interval, with the interval to be adjusted by BNP depending on the amount of fouling found in the instruments and its effect on the data. The servicing schedule for the five ADP's and the twelve CTD's is provided in Table 5, and the servicing intervals are given in Table 6.

The long-term instruments were programmed to collect data at sample intervals ranging from 15 minutes to 1 hour. CTD salinity and water level data were collected, for example, at 15-minute intervals. Before deployment, the CTD's were calibrated for conductivity and pressure (depth) as discussed in Appendix C and Chapter 4. Retrieved CTD's were checked for conductivity and depth calibration, cleaned and serviced, defective sensors replaced, recalibrated for conductivity and depth, and the instrument readied for redeployment by BNP. The Sea-Bird data were taken during CTD instrument servicing trips.

During the two intensive surveys, current speed and direction data were obtained approximately hourly at the inlets and channels by traversing each cross-channel transect over a typically eight-hour period using boat-mounted ADCP's. The surveys for a given day were timed to provide approximately hourly synoptic discharge data for the transects measured. The starting and ending positions of each transect were located with global positioning system (GPS) equipment to ensure line location fidelity throughout the survey. Three boats were required for monitoring all 27 transect locations. Due to the large number of inlets and channels monitored throughout the Bay, three days were required to complete each survey. The number of openings that could be monitored daily in order to obtain the hourly measurements was limited by the width of the openings and the distances between them. The primary advantages of the boat-mounted ADCP technique for measuring channel discharge are the excellent spatial resolution that it provides in the lateral (cross-channel) and vertical (profile) dimensions. The ability of CHL software to integrate this detailed information into simple discharge values for each transect crossing makes the ADCP data especially useful.

Data Collection Equipment

The CTD's deployed were YSI 6000's (YSI, undated) with absolute pressure gauges, temperature, pH, DO, and conductivity sensors. The park provided five additional YSI 6000's as calibration units and for rotating the sensors to other locations during their service trips. YSI instruments employed as calibration units were used to determine the conductivity of the secondary, seawater standard, as discussed in Appendix C and Chapter 4. A YSI 6000 unit is shown in Figure 6. Also, see Figure A15 in Appendix A.

Figure 6. One of the CTD's deployed in the BNP/CHL data collection effort

Five bottom-mounted ADP's were deployed for long-term collection of current speed and direction profiles. See Figures 7 and A2. These instruments were 1.5-MHZ SonTek Acoustic Doppler Profilers. They are 30 cm (12 in.) high and 20 cm (8 in.) in diameter. An external battery pack allows operation for about six months at 15-minute data sampling intervals. Special mounting platforms were designed and fabricated to house the ADP's. These platforms rested on the bottom and were designed to protect the ADP's from nets and fishermen during deployment. See Figures 8 and A4. The overall bottom grate and dome are about 1.83 m (6 ft) in diameter and the ADP is mounted on a pedestal in the center that raises it about 30 cm (1 ft) above the bottom. Water-level recorders and two bottom-mounted ADP's were purchased through BNP with funds provided by the study group participants.

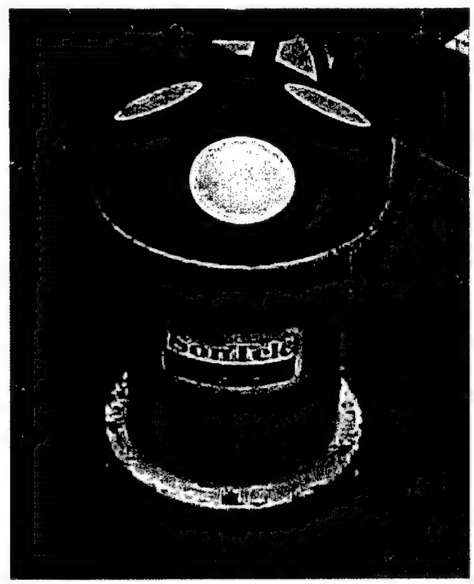


Figure 7. ADP as used in the Biscayne Bay field study

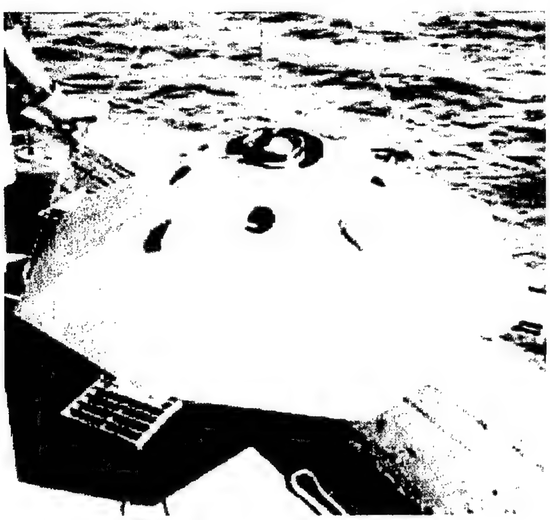


Figure 8. Bottom protective mount in the process of deployment

The meteorological station was a W2000 WEATHER PAK. See Figure A20. The evaporation pan was specially made for south Florida application. See Figure 9. This evaporation unit was a stainless steel pan 1.22 m (4 ft) in diameter and 25 cm (10 in.) deep. It operated with a float to determine change in water level. Float position was calibrated to indicate water level position, and float position changes were recorded digitally and stored as water level changes. Each night at midnight the water level was (automatically) returned to the same nominal level. Evaporation is found by subtracting the meteorology station rain gauge reading from the evaporation pan change. The evaporation pan *per se*, being open to the rain, thus measures "net rainfall."

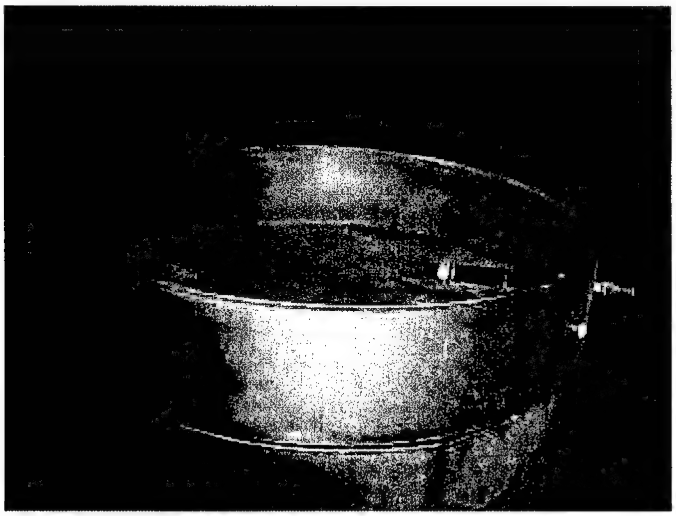


Figure 9. Meteorological station evaporation pan

The intensive survey current speed and direction measurements were obtained using boat-mounted 1200-kHz Broadband ADCP's. See Figures 10, 11, A1, and A3. The four acoustic transducers are visible in Figure 10.

The equipment used in this study was selected based on prior successful use of the equipment, available existing equipment at both CHL and BNP, and the specifications for the measurement capabilities of each instrument.

Additional Data

Discharge data from control structures

Though not part of the BNP/CHL data collection effort, inflows into Biscayne Bay are necessary for the development of a numerical hydrodynamic and salinity model. To that end, information about canal inflows was collected by CHL from the SFWMD. Sixteen structures that controlled inflow into the Bay were identified and reported. The operations of these structures are under the control of the SFWMD. Discharge data for each structure were acquired with the help of

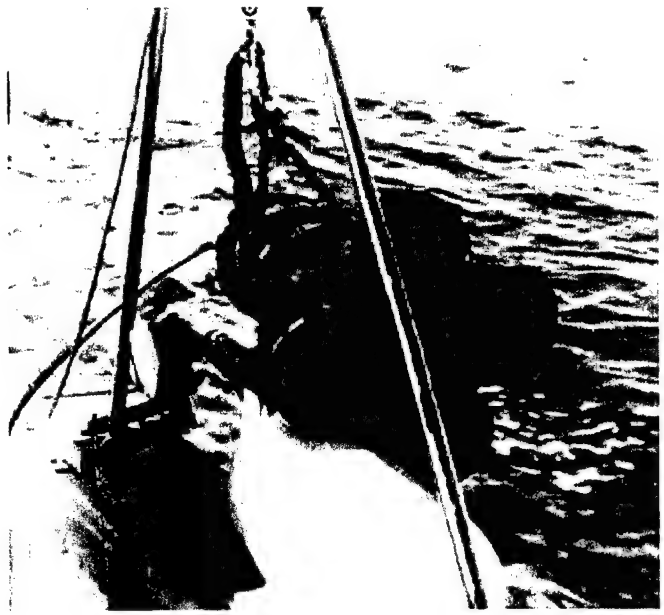


Figure 10. The 1,200-kHz Broadband ADCP secured for travel to Transects 25, 26, and 27 during February 1998

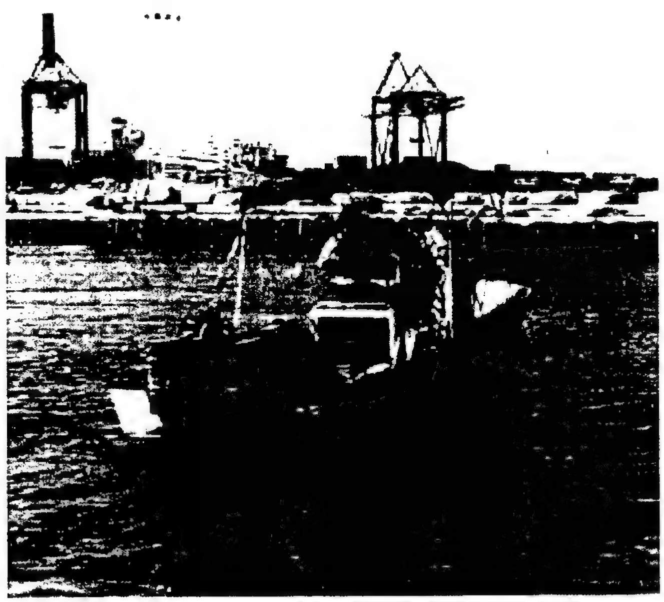


Figure 11. BNP vessel used in intensive ADCP February 1998 survey. Note ADCP (portside) mounted for travel to transect

Ms. Angela Chong, Messrs. Muluneh Imru, Emile Damisse, and Matt Davis of SFWMD (Chong 1999[1]; Imru and Damisse 2001[2]; Davis 2001[3]). The DBHYDRO database was the basic information accessed and converted to discharges by the SFWMD. Tables 7 and 8 summarize the total discharge per month for each control structure and also provide descriptive information about the sites. Mr. Davis' contribution involved the exact timing of the flows from the lone manually operated structure, S197. SFWMD also provided information on the structures and the uncertainties inherent in the flows. (Imru 2000; Davis 2001). The detailed discharge data (DBHYDRO) are available from the SFWMD. Further details can be found in Van Horn (1996) and Swain et al. (1997). Figure 12 shows structure S20F on Mowry Canal near the BNP headquarters building.

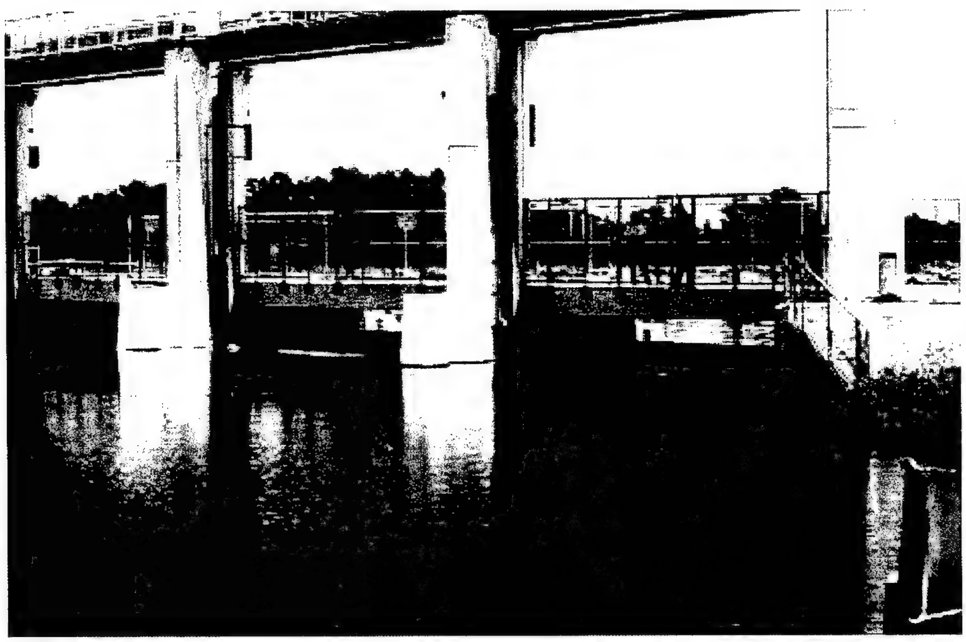


Figure 12. Structure S20F on Mowry Canal looking east (downstream) toward Biscayne Bay

Salinity data

Additional data were also provided by DERM from their monthly Bay Run data collection effort. These data are composed of more or less monthly values of salinity data collected at three depths (surface, 1 m, bottom) at various locations in the Bay, in the mouth of various canals, and inland of the canal mouths. The data taken during the BNP/CHL effort were of primary interest. These data are

[1] Chong, A. (1999). South Florida Water Management District, West Palm Beach, FL. Personal Communication.

[2] Imru, M., and Damisse, E. (2001). South Florida Water Management District, West Palm Beach, FL. Personal Communication.

[3] Davis, M. (2001). South Florida Water Management District, West Palm Beach, FL. Personal Communication.

included in the BNP/CHL data and plots. Location maps are provided in Figures 13-16, and further discussion is provided in Chapter 3. Bay Run location proximity to the BNP/CHL stations are also shown in Figures 13-16 (red circles).

Though these monthly data are rarely at the same location as the BNP/CHL CTD sites, the Bay Run data provide insight into the salinity conditions in the general vicinity of the BNP/CHL sites for the times they are recorded. Also, the surface values of these Bay Run data are, generally, closer to the surface and provide a better picture of the stratification of the system than the Sea-Bird profile data. Finally, these Bay Run data provide another set of prototype salinity data for use in development of the numerical model.

Dr. Joe Boyer of Florida International University provided a draft copy of his data collection and analysis report performed for SFWMD (Boyer 2000). This report was examined, particularly the salinity values, and provided to the model development team at CHL.

Water-surface elevation data

Ms Emily Hopkins (Hopkins 2000) of the SFWMD generously provided draft tidal data for Barnes Sound. NOAA tide data from the Virginia Key station were also downloaded. Neither data set will be discussed further here.

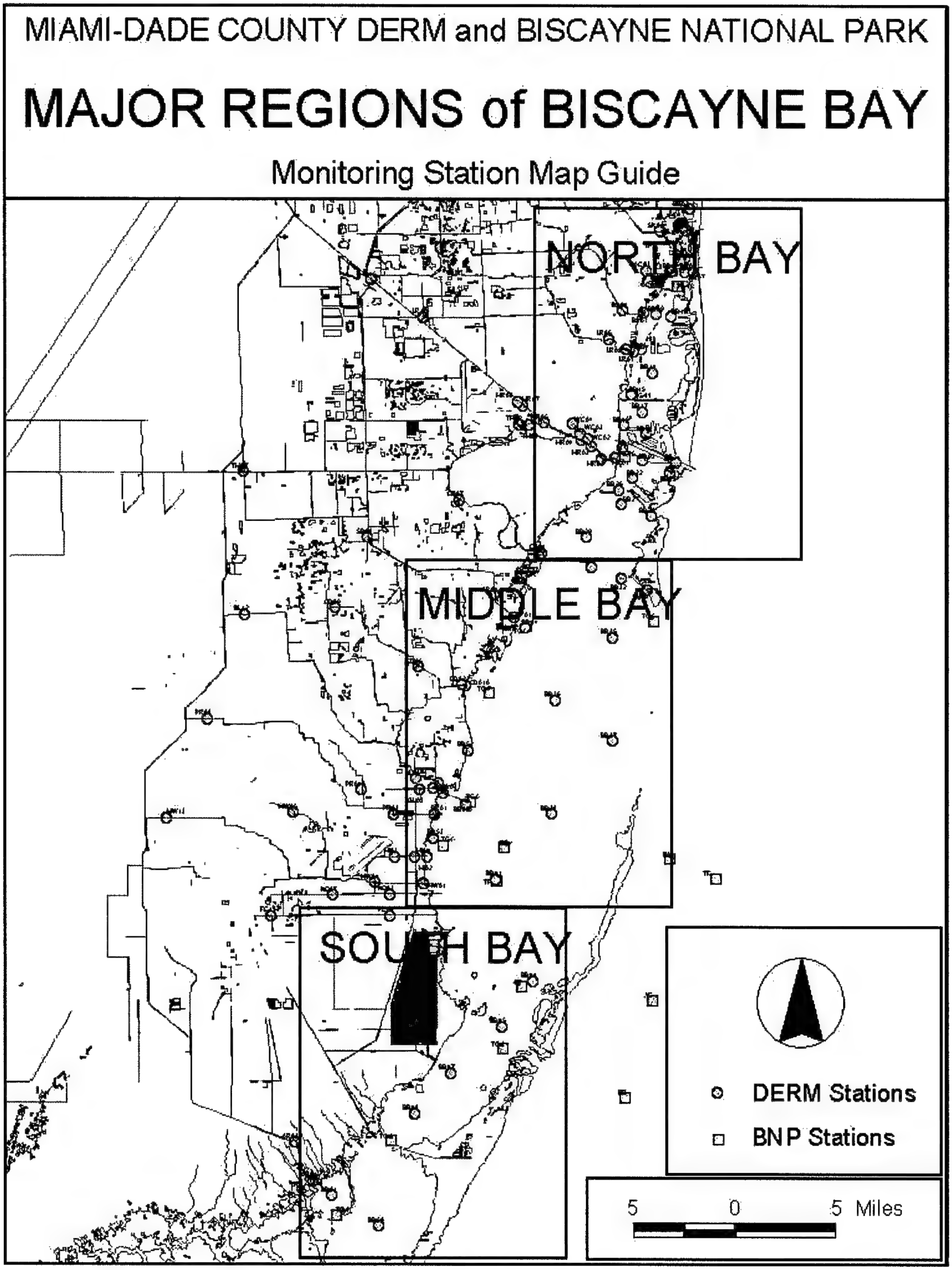


Figure 13. Major regions of Biscayne Bay for defining “Bay Run” sites. (Courtesy Tim McIntosh, DERM)

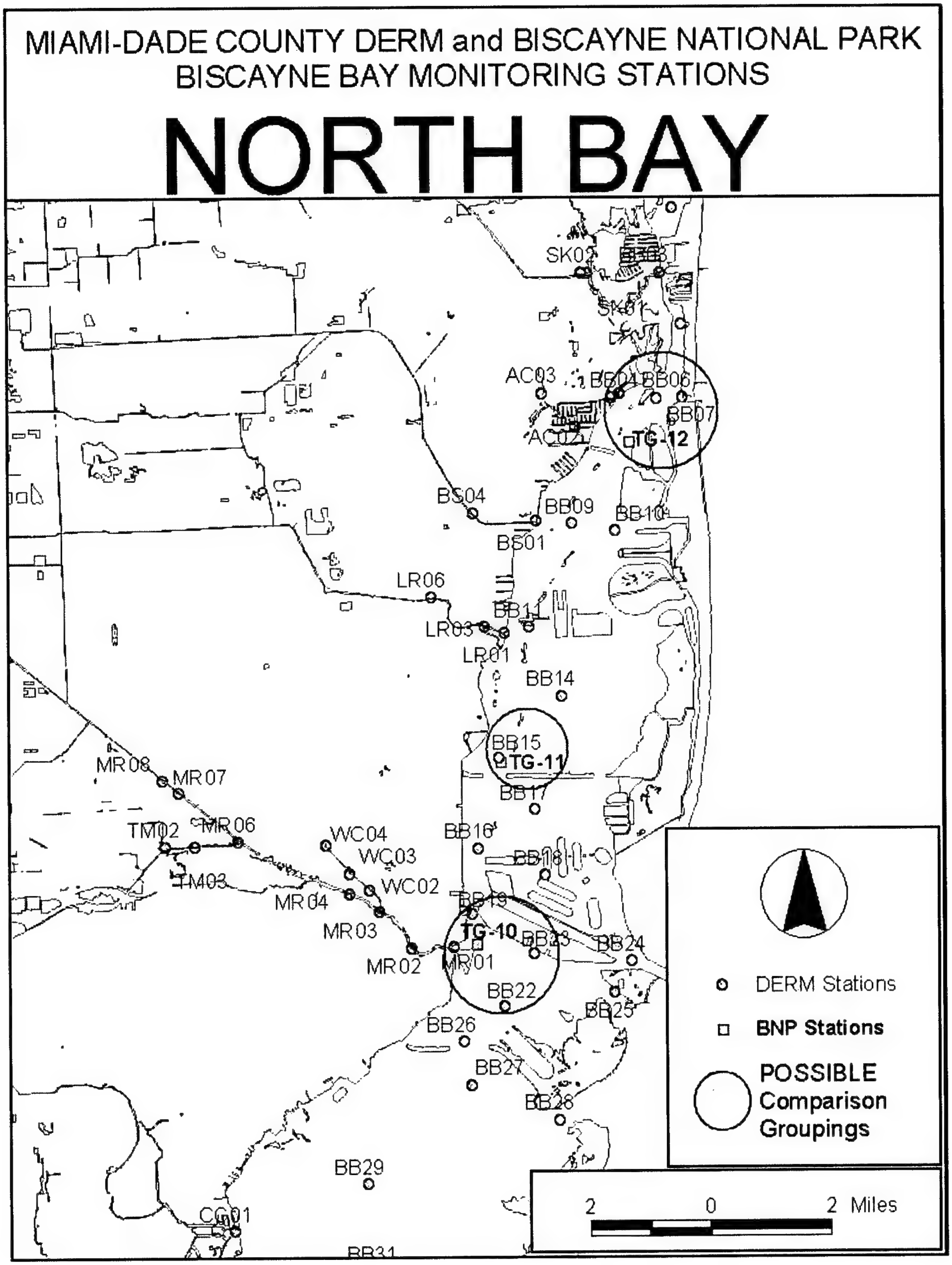


Figure 14. North Bay, showing "Bay Run" sites and CTD10 (TG-10), CTD11 (TG-11), and CTD12 (TG-12). Red circles isolate Bay Run stations proximate to CTD's. (Courtesy Tim McIntosh, DERM)

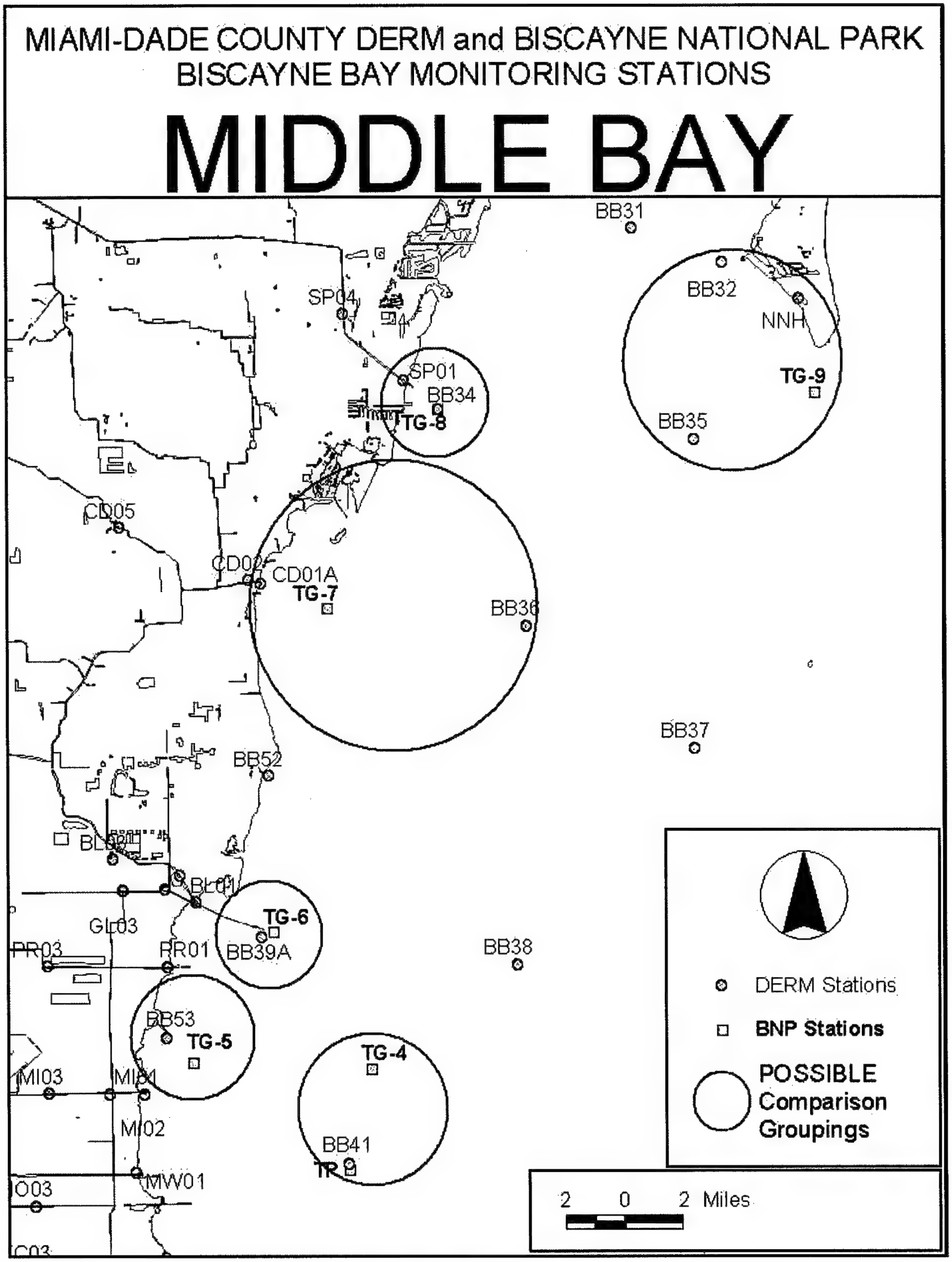


Figure 15. Middle Bay, showing “Bay Run” sites and CTD4 (TG-4), CTD5 (TG-5), CTD6 (TG-6), CTD7 (TG-7), CTD8 (TG-8), and CTD9 (TG-9). Red circles isolate Bay Run stations proximate to CTD’s. (Courtesy Tim McIntosh, DERM)

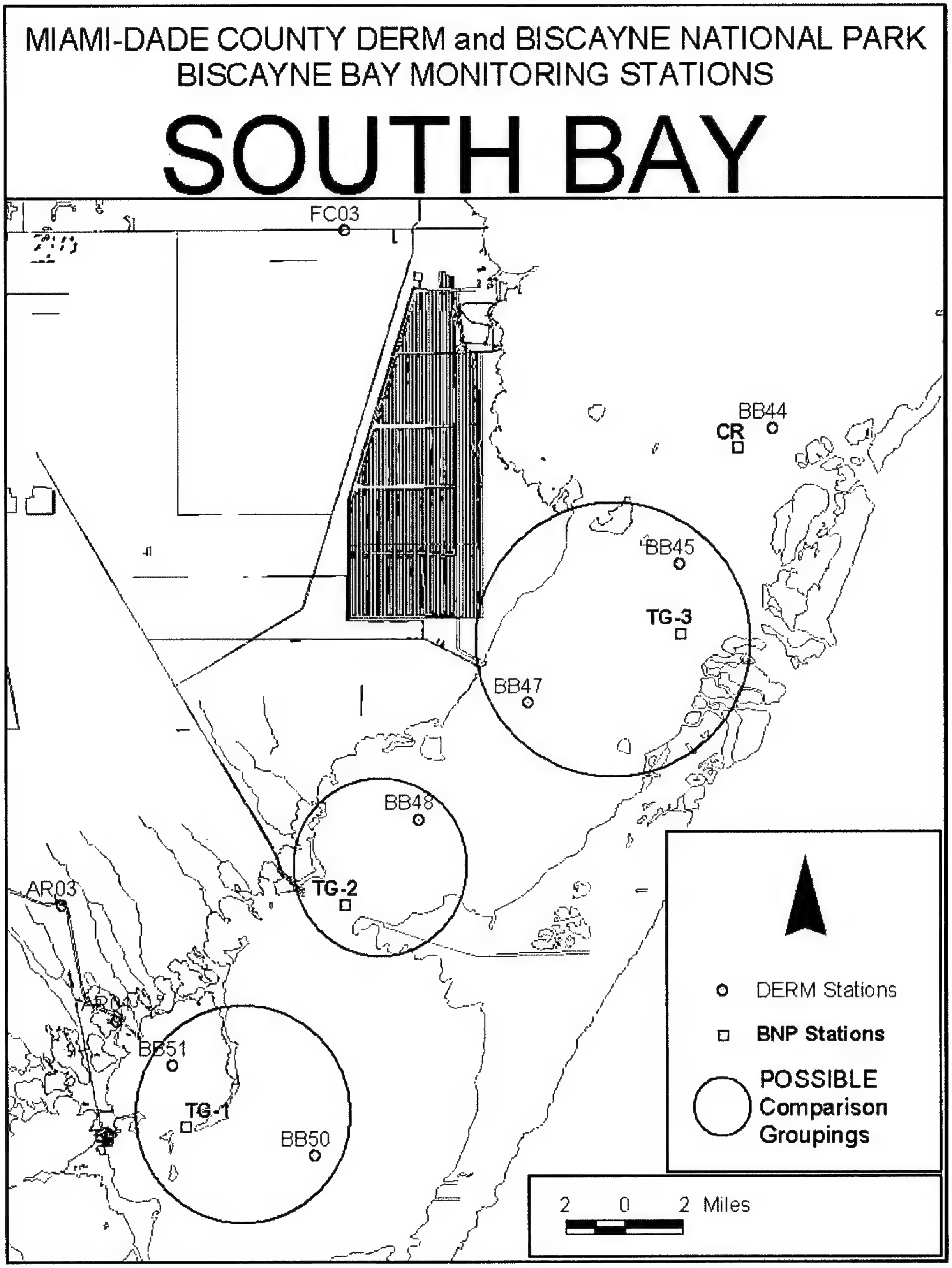


Figure 16. South Bay, showing "Bay Run" sites and CTD1 (TG-1), CTD2 (TG-2), and CTD3 (TG-3). Red circles isolate Bay Run stations proximate to CTD's. (Courtesy Tim McIntosh, DERM)

3 Data Collection: General Discussion

General discussions of the BNP/CHL data and their collection follow, with references made to the included sample plots and other plots and tables as appropriate. Sample plots in Plates 1-168 provide February 1998 snapshots of the various kinds of data collected by the weather station (Plates 1-11), the five ADP's (Plates 12-96), and the twelve CTD's (Plates 97-168). These plates are intended as an overview contextual set of graphs for the data retrieved in the long-term and short-term efforts. Plates 169-221 show plots of ADCP transect discharges and nearby CTD water level measurements, and Plates 195-209 show plan view plots of depth-averaged velocities for a particular transect crossing at all 27 ADCP transects. Various figures, primarily involving water-surface elevations and salinity, are included to provide additional, more specific and detailed examples as illustration for points made in the following discussions. Further data discussions, especially as relevant to the quality of the data, are included in Chapter 4. The full data set, as discussed earlier, is available from ERDC or SAJ.

Long-term BNP/CHL Data

Weather data

Plates 1-11 are representative time-history plots of the weather data from the meteorological station during a 30-day period of record (February), plotted on 15-minute intervals, except for the daily rainfall and evaporation data. Time-history plots permit the identification of trends and changes occurring during a particular period of record. Such time-history plots are also useful in identifying any problems with sensors that may require attention. The data files contain 15-minute, one-hour, and 24-hour average weather data.

Specialized processing codes were developed by CHL to interrogate the weather data files and to retrieve the required information for plotting and visualization. Weather parameters obtained included scalar average wind speed, resultant (vector average) wind speed, resultant wind direction, average air temperature, relative humidity, rainfall, evaporation, barometric pressure, solar

radiation flux, and solar radiation. Table 9 provides monthly summaries of the weather data.

Wind data obtained during the July 1997 to July 1998 period generally support the annual cycle that has been observed in previous weather records. The cycle consisted of winds being predominantly southeasterly during the spring and summer months, followed by a shift to northeasterly winds during the fall and winter months. The wind directions started in July 1997 with a direction (coming out of the compass direction) of approximately 120°. As the season progressed through the fall of 1997, the direction changed to the low 50° range. The late fall and early winter directions tended to fall to the low 50° range with a return to the 120° range for the spring and summer. Significant wind events are seen in the data, such as the onshore blow recorded for late January to early February 1998. Wind speed and direction were also translated into the magnitude and direction of the corresponding wind stress. These analyses and results are discussed in Appendix B.

Air temperatures in the study area were found to range from 15 °C to 32 °C throughout the year. Due to instrument malfunction, air temperatures were not measured from 27 October 1997 to 31 March 1998. Due to equipment malfunction rainfall was not recorded from 17 July to 17 October 1997 (see Table 9 and footnote). This problem was corrected and the equipment operated successfully from October 1997 to July 1998.The highest rainfall recorded by the meteorological station occurred during the period December 1997 through February 1998. In December 1997 and February 1998 rainfall amounts of 168.66 mm and 160.28 mm, respectively, were noted. Due to the missing rainfall data already noted, it is uncertain whether these rainfalls were the highest at this location for the June 1997 to June 1998 period. However, this year was considered to be unusual, with a dryer wet season and a wetter dry season (which includes the December to February period) (Burzycki)[1].

Solar radiation maximum values generally followed the seasonally varying zenith angle of the sun at local noontime. Maximum values occurred during the months of May-August when the sun was more nearly directly overhead at the latitude of Biscayne Bay. The minimum values occurred during the fall and winter months (September-January) when, in addition to the aforementioned solar zenith angle minimum, clouds were more prevalent due to passing storm fronts.

The return of the data from the weather instruments was 100% with the exception of the rainfall parameter and the air temperature sensor.

ADP velocity data

The ADP velocity and direction profile data were collected using a 15-minute time interval. The individual ADP velocity data points were an average value for

[1] Burzycki, G. (1999). Miami-Dade County Department of Environmental Resources Management. Personal Communication.

a 2-minute interval within each 15-minute period. This data collection procedure for the ADP data was necessary to conserve battery life and storage space during the deployment period. Deployment depth at the five ADP deployment locations ranged from 2 m to 3.2 m (see Appendix C). The five ADP units were bottom-mounted with the sensing head oriented upward while making a measurement. A measurement of velocity and direction was recorded in 30-cm "bins" through the water column above the sensor head.

A "bin" is a segment of the vertical water column distance. For example, if the portion of the water column for which data are collected is 150 cm deep, five velocity results, one for each of the 30-cm bins, are reported for the water column. Velocity data are reported as an average over this spatial segment, or bin. Such an averaging distance is analogous to a time period over which temporal measurements are averaged before being reported, and bin size can be varied similarly to the way averaging time can be set by the researcher. The velocity information is reported as near bottom, middle, or near surface depth. Near bottom means data from the lowest (deepest) bin are reported; middle means data from the bin half way between the near surface bin and the near bottom bin are reported; and near surface means data from the highest (shallowest) bin are reported. The deepest bin is not at the bottom due to the finite size of the ADP and near field effects (the blanking distance above it); and the shallowest bin is not at the surface due to surface irregularities (surface blanking distance).

Blanking distance is a segment of the water column for which data cannot be reliably recorded by the ADP instrument. Immediately above (in front of) the instrument, out to approximately 30 cm, velocities are not reliably recorded due to limitations of the instrument in recording data so close to its transducers. The first good bin, then, is approximately 60-90 cm above the bottom (due to the finite size of the instrument with mounting and the blanking distance above the meter). Similarly for the surface bin, it is actually 30 or 60 cm below the surface due to the blanking distance at the surface. This surface blanking distance is due to the irregularity of the surface, from wave action, for example, and its adverse effect on the near surface ADP readings. The exact size of this near surface blanking distance depends on the irregularities of the surface; quiet waters will result in smaller and rough waters larger blanking distances. No vertical control was provided for the ADP locations. However, the meters were returned to the same deployment site each time, so that there was no significant change in vertical location. In addition to the acoustically measured velocity profiles, pressure and temperature sensors incorporated into the ADP head measured these parameters. Tables 10-14 summarize the ADP data for the five stations. Appendix C discusses the deployment times (see also Table 5), servicing times, and the status of velocity data collected during each data collection period.

The pressure data (depth) in the tables for the ADP current velocity and direction instruments are not corrected for local atmospheric pressure. From the pressure sensor data, however, the range and phase of the water-level fluctuations above the instrument were deduced. This information allowed the velocities to be characterized as ebb or flood. Essentially, portions of the current velocity components occurring during the rising tide portion of the tide signal, particularly peak velocities, were assumed (defined) to be flood currents for the particular

ADP location. The results presented in Tables 10-14 include the ebb/flood information. Thus, periods for which the pressure gauge was operable, only, are shown in the tables (see note at Table 13). A further problem results from the failure of the pressure sensor, which is detailed below.

The velocity directions displayed in the tables represent the direction toward which the current is flowing. Velocity data for periods when the pressure gauge was not working, viz., ADP4, were also recorded. Since the pressure was not recorded while the pressure gauge was not working, however, the relationship between the current velocity and the stage of the tide at ADP4 cannot be determined from the ADP4 data set. Furthermore, when the pressure sensor is not working properly, as at ADP4, assignment of depths to bins, and thus the unambiguous determination of, at least, the surface and middepth, bins, is not straightforward. ADP4, for example, reported depths of over 40 m for most of its deployment (while the pressure gauge was malfunctioning), even though it was deployed in water about 3-4 m deep. See Plate 78. The raw data show the number of bins as constant, implying that the surface and middepth bins do not move in response to the tide. Due to the uncertainties inherent in this data set for ADP4, only the portions during which the pressure gauge was operating properly were summarized in Table 13. The ADP plates present samples of these questionable data for ADP4, but these data should be used with caution. ADP1 was the only other of the five instruments to encounter significant problems, mainly with its battery power during 1997, as discussed in Appendix C.

Plates 12-96 are representative monthly time-history plots (February 1998) generated from the ADP data at Stations 1-5 for near surface, middepth, and near bottom elevations. By collecting the 30-cm velocity data into the three elevations, differences in flow patterns throughout the water column and across the Bay can be observed. For example, Plates 12, 17, and 22 show that the velocity magnitude, or speed, of the current is greatest at middepth for ADP1. The ADP records were also used to generate two-dimensional cumulative transport diagrams in conjunction with the wind stress records discussed in Appendix B.

CTD water-surface elevation and salinity data

Plates 97-168 are representative sample plots of the continuous time-history plots of temperature, specific conductance, salinity, dissolved oxygen, and water-surface elevation data from the twelve CTD sensors deployed in Biscayne Bay during February 1998. Tables 15-26 provide summaries for the twelve CTD stations, including maximum, minimum, and mean values for each parameter measured at each location by month, as available. Maximum and minimum values are, respectively, the largest and smallest values for the given parameter during the month described that were deemed acceptable for averaging. Footnotes in the tables highlight months when data were rejected for the purpose of averaging. For example in Table 15 no salinity data were presented by CTD1 during March 1998. Also, depth data for CTD7 in Table 21 during June 1997 were rejected because the depths were more than an order of magnitude off, and salinity data in Table 25 for CTD11 during June 1998 were not averaged due to severe drift problems. The mean value is the average of all values of the particular parameter

during the month described. These data were recorded on 15-minute intervals, the same sample interval as the ADP and much of the weather data. Though DO values are reported, no QA/QC is provided for DO values except to eliminate negative values before averaging.

Gaps in the data generally reflect the malfunction of a sensor on the CTD instrument. Examples of a brief data gap near a service period can be seen in Plates 105 and 106 during the 15 February 1998 to 17 February 1998 period for CTD2. CTD2 also produces salinity values based on these parameters. Figure 17 shows the salinity values in the vicinity of the gap, and all available data, including comparison data from DERM's Bay Run data set and the BNP Sea-Bird data, are displayed. See also Plate 104. Thus one can see the time that elapsed between when the replacement instrument was turned on and deployed in Figure 17 as a straight blue line of symbols at 0 salinity. This gap is probably due to a meter failure just before the servicing. The horizontal axis is presented in Julian hours, with hour one being 0100 1 January 1997. Thus, for example, Julian hour 9900 is Noon 17 February 1998. Table 27 relates Julian hour and calendar days.

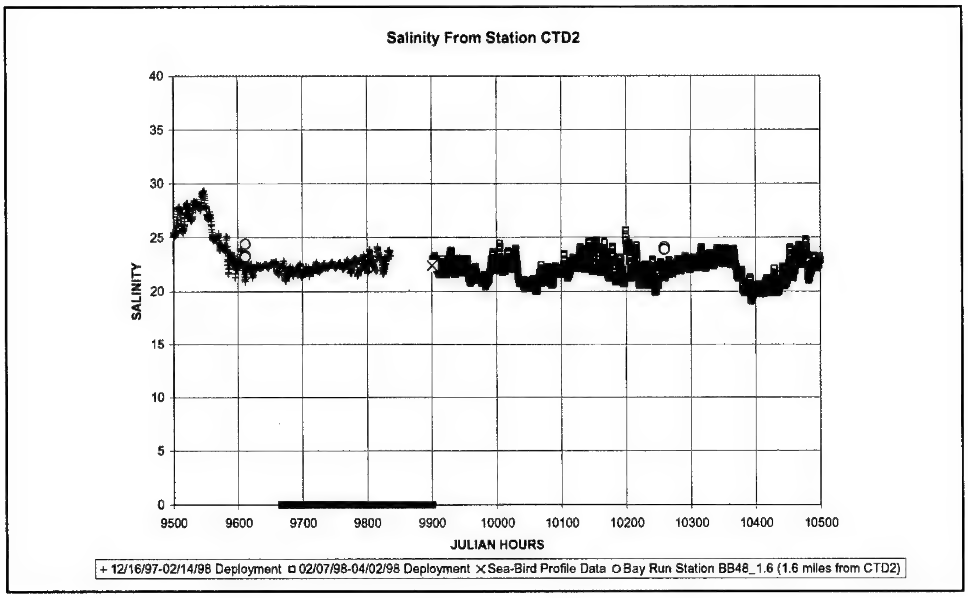


Figure 17. Salinity at CTD2 during February 1998

In Figure 17 the red X represents a salinity measurement taken when the meter was serviced by BNP (the "Sea-Bird" data). The exact moment of the measurement is unknown, so all such Sea-Bird measurements are placed in the data during the middle point of the inferred servicing interval as best as possible. The presence of only one X indicates that no vertical salinity structure was seen at the location in the portion of the water column sampled by the Sea-Bird. The Sea-Bird measures from near the surface to the bottom of the water column. The surface portion of the water column is the most uncertain of the profile values taken.

This uncertainty is because the Sea-Bird instrument was lowered to a depth of, approximately, 1 m and allowed to equilibrate before the vertical profile was taken. The vertical profile was taken, then, by lowering the instrument through the water column. Values of temperature, conductivity, depth, and salinity were then recorded as a function of time in the water, as shown in the example provided as Figure 18. Figure 19 shows the Sea-Bird instrument. Since the instrument is approximately 1 m in length, full submersion places the sampling

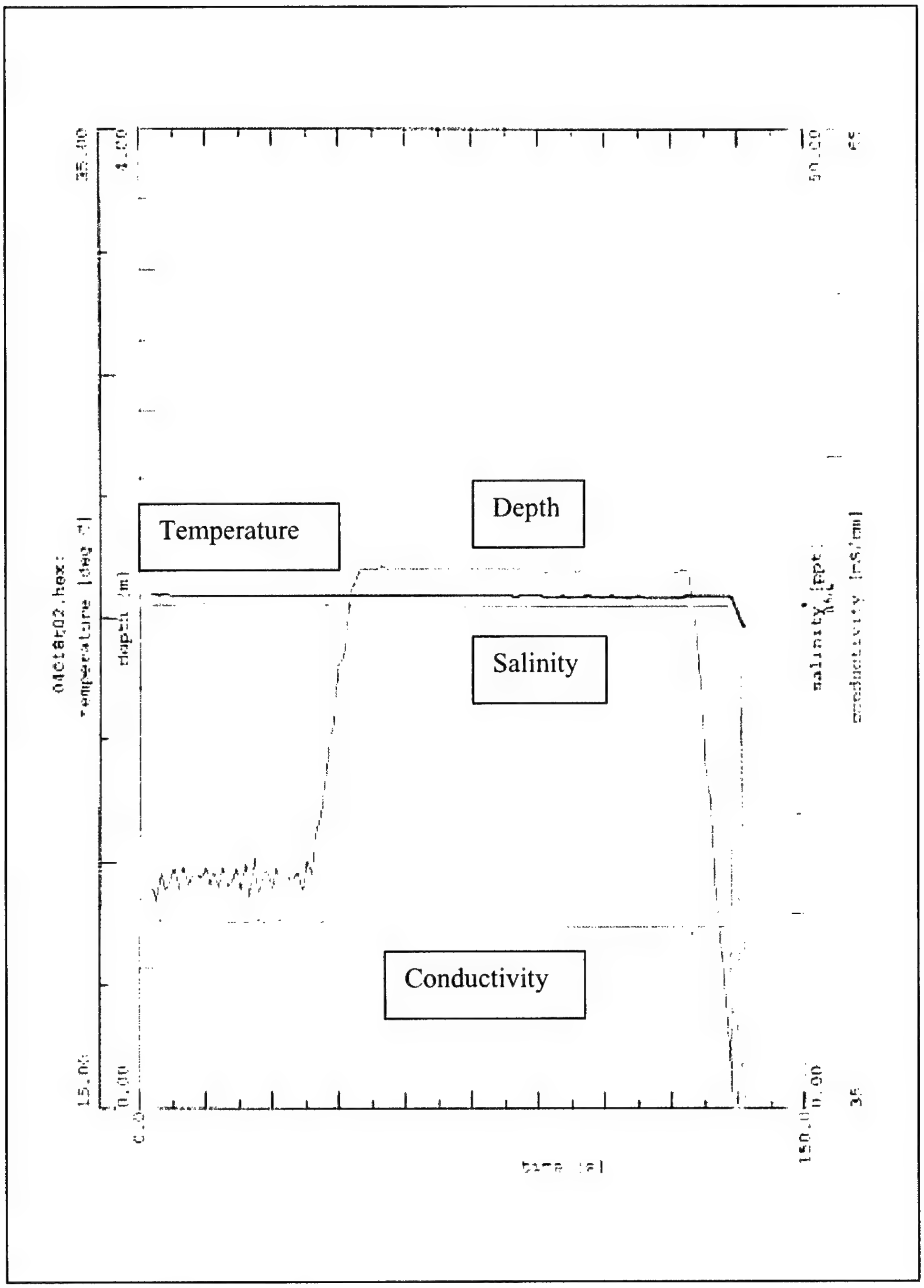


Figure 18. Data from Sea-Bird profile measurement at CTD2 on 1 April 1998. (Courtesy Mitch Granat, SAJ)

intake for the instrument at approximately 1-m water depth. Thus, the surface layer of about 1 m in depth was not measured. When the Sea-Bird was brought back to the surface and into the boat it passed through the top 1-m layer. However, this retrieval phase of the profiling was done too rapidly and without the intent of determining the surface layer salinity. Hence our lack of knowledge, from the Sea-Bird data, of the salinity of the top, approximately, 1-m layer of water.

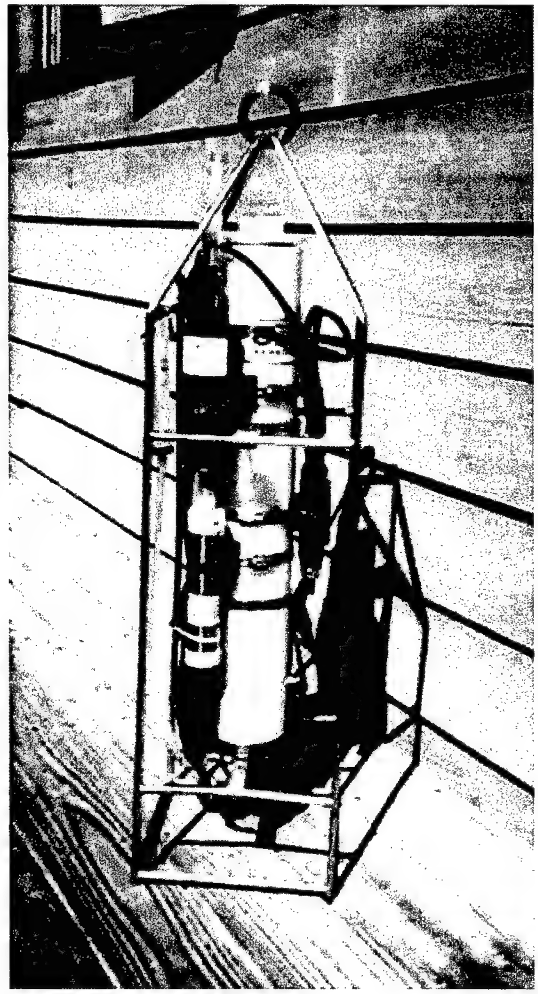


Figure 19. Sea-Bird instrument, in protective cage, as used in the field effort

At the 1 April 1998 profile at CDT2, for example (Figure 18), the Sea-Bird was equilibrated at about 1-m depth, and then the profile recorded to a depth of about 2 m, with no indication of salinity structure. The surface to 1-m depth salinity is thus unknown in this case. Figure 18 shows the Sea-Bird data from which the 1 April 1998 over-the-side data were extracted, and from which the equilibration depth, total depth, and lack of salinity structure in the measured part of the water column can be seen. When only one Sea-Bird datum (one red X) is seen on the plots at a particular time, then the inference should be that no stratification was measured at the profiled site in the portion of the water column profiled. See Figure 20. The red X value was derived from Figure 18. Biscayne Bay, especially in the vicinity of canals, such as Mowry Canal, can and does experience large stratification events. These events are characterized by the confinement of the fresher water to a surface lens that is less than 1 m in thickness, and thus not in the portion of the water column profiled by the Sea-Bird (Bellmund, Browder, and Alspach 1999; Burzycki[1]; Curry[2]; Alleman[3]).

The other red marks in Figure 17 are Bay Run data points, and the legend gives the name of the Bay Run station and the distance in miles of the Bay Run station from the CTD location. For example, in Figure 17 the legend shows a red circle followed by "BB48_1.6." The "BB48" is the name of the Bay Run site, and the "1.6" is the approximate distance, in miles, between the CTD station (CTD2 in the case of Figure 17) and the Bay Run station BB48 (see Figures 13-16). When more than one Bay Run station is plotted, additional symbols are used

[1] Burzycki, G. (2000). Miami-Dade County Department of Environmental Resources Management. Personal Communication.
[2] Curry, R. (2000). Biscayne National Park, Homestead, FL. Personal Communication.
[3] Alleman, R. (2000). South Florida Water Management District, West Palm Beach, FL. Personal Communication.

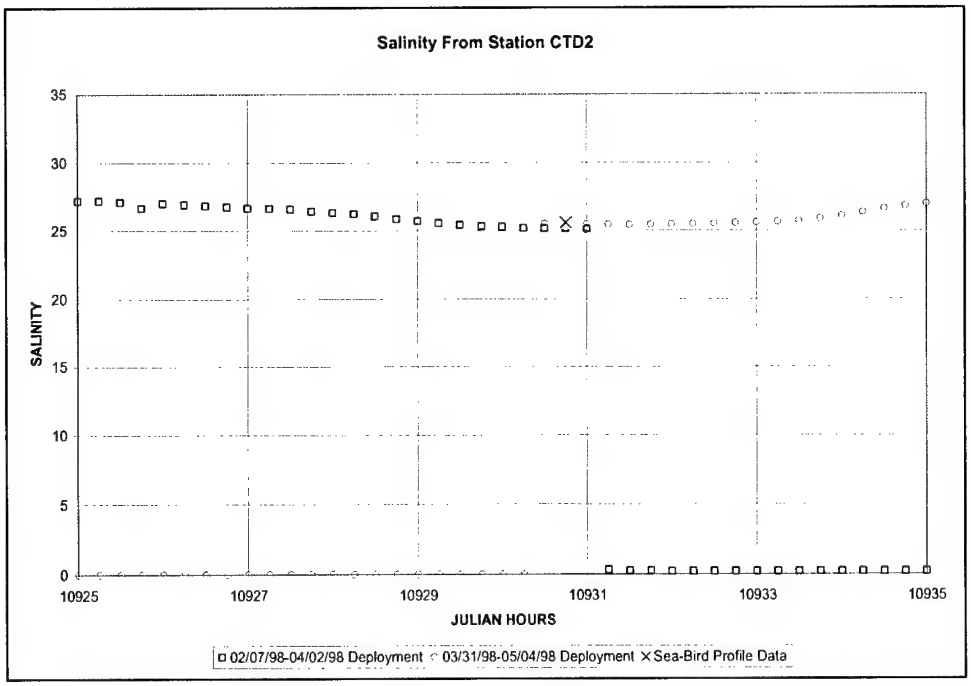


Figure 20. Salinity at CTD2 showing dual deployment data sample overlap

in the legend. Bay Run salinity data are vertical profile data taken near the surface, at 1-m depth, and near the bottom for a given location. More than one symbol for a given Bay Run station, then, means that the Bay Run measurement detected a stratified water column at the site. Such a case is seen in Figure 17 near Julian hour 9600 for BB48.

The plan at each servicing event was for the values of the retrieved and the deployed instruments to overlap for a few readings (two to three readings over 30 to 45 minutes). Figure 20 shows a typical overlap of three values. The time between when the CTD was turned on and deployed for the "to be deployed" CTD can be seen (blue circles at 0 salinity), with values jumping to about 26 salinity at deployment at about 1030 1 April 1998 (Julian hour 10,930.5). The "to be retrieved" instrument is seen to be recording salinities for three times while the new meter is in the water (blue squares), and then the retrieved meter values drop to near zero values, indicating that the device has been retrieved and is on its way to the laboratory.

These overlaps are useful for establishing the continuity of the meter reading in the face of instrument drift. The Sea-Bird datum (red X) is also evident in Figure 20. The similarity of these three readings lends confidence to the CTD values. No Bay Run data were available during the 10-hour time frame shown in Figure 20. Figure 21 shows the simultaneous deployment physical arrangement that allows for this overlap of values at CTD5 (TG5).

An example of a catastrophic sensor malfunction can be seen in Figure 22 for CTD11 during early December 1997. This spectacular failure was compounded

by the failure of the replacement device. The CTD came loose from its mooring and was found at the South Beach jetty. The Sea-Bird data were dutifully recorded, however, as indicated by the red X at the December 10 mark (near Julian hour 8250) in Figure 22. This and other features of the data record will be addressed to the extent of available relevant information in Chapter 4.

Outlier data, usually appearing around the servicing dates and that are known from experience to indicate that the meter was, for example, sitting in the boat turned on or in the water but not yet equilibrated, are not included in the calculations for Tables 15-26 or in the plots provided as plates. Figures such as Figure 22, for example, show all salinity data that were recorded by the CTD instrument during the plotted time period, outlier and "good" data alike. These outlier data are included so that other interested researchers can make their own judgments concerning their usefulness. Further discussions of these data are included in Chapter 4.

Figure 21. Simultaneous deployment during servicing at CTD5. (Courtesy Richard Curry, BNP)

Except for the water-surface elevation data, Tables 15-26 and Plates 97-168 contain values

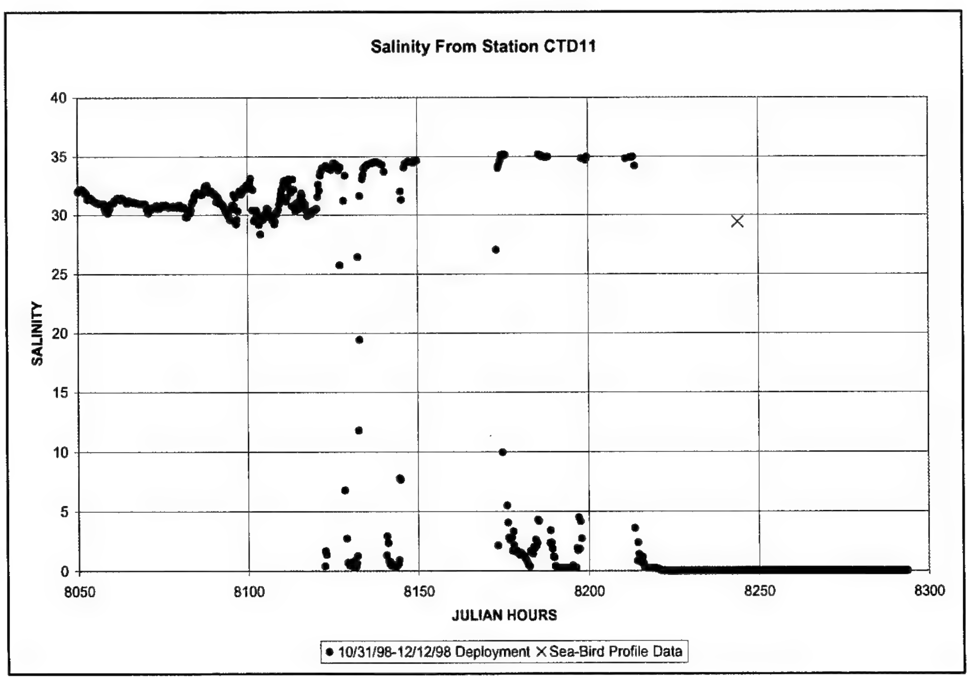


Figure 22. Catastrophic failure of CTD11 due to meter coming untethered

derived from raw CTD data. Only obvious outlier data and data that were judged to be misleading were excluded from the tables and the plates, as discussed above. The water-surface elevations were adjusted for atmospheric pressure, datum and drift, as discussed in Chapter 4. In brief, all water-surface elevation data for a particular CTD location from the various data collection periods during the year were adjusted to provide an approximately continuous record of water-surface elevation. This first approximation to obtaining a continuous water-surface elevation was accomplished by gross movement of some data to approximately match up water-surface elevations with adjacent data at their "match points" (the overlapping data points). The particular method for making this initial adjustment was to equate the average values of the data from the various deployment periods. This process was necessary since the CTD's were not always calibrated the same or did not remain mounted at the same elevation during each deployment. Such manipulation of the datum of water surface data is common practice to obtain as continuous a record as possible and to enable the comparison of curve shape with other results, such as from synthetic or model calculated tides. The basic assumption employed is that the water-surface elevation is continuous in time. The gross adjustment described here accounts for most of the adjustment needed; more detailed adjustments can be made to line up the ending of one water-surface elevation data set with the beginning of the next to the extent possible given meter drift and other, usually small, uncertainties in the water-surface elevation data. Further, the water-surface elevations were related to the NGVD29 datum through the surveys of the CTD pressure orifice locations.

Figure 23 shows an instance, during late June 1998 when the float holding CTD5 erect in the water column (see Figure 21) was lost. The meter was discovered on its side in the water, but still recording good data. Figure 23 shows a portion of these data. The top plot of data shows the raw pressure data, indicating the depth of water above the sensor, uncorrected for barometric pressure. When the float comes loose the depth of water above the meter increases as the device falls to the bottom. This all happens during the 15-minute interval between recorded values, and it is clearly seen as an increase of depth over the meter of about +30 cm (1+ ft) at about Julian hour 12,825. The lower plot shows the data with the "no float" portion adjusted to near where it "should be" by equating the long-term averages before and after the event and with the whole data set adjusted to NGVD29 elevation and corrected for barometric pressure. This will be discussed further in Chapter 4.

Another related potential problem in data recorded by instruments suspended by a float occurs when water levels get low enough that slack appears in the float line. When this happens, the instrument will sink and data will be recorded for the wrong depth. The pressure head, for example, will be larger than it would have been had the line not become slack. This appears to have happened in some portions of the CDT5 pressure head data, particularly when the head is less that 60 cm (2 ft). Evidence of a flattening of the pressure head curve can be seen at some of the low tide data of CTD5, especially when the head is below 60 cm (2 ft). Other factors such as local atmospheric pressure differences, wind-induced currents, and salinity conditions at the shallow water site could play a role in this phenomenon. The resulting water level differences appear to be minor and limited

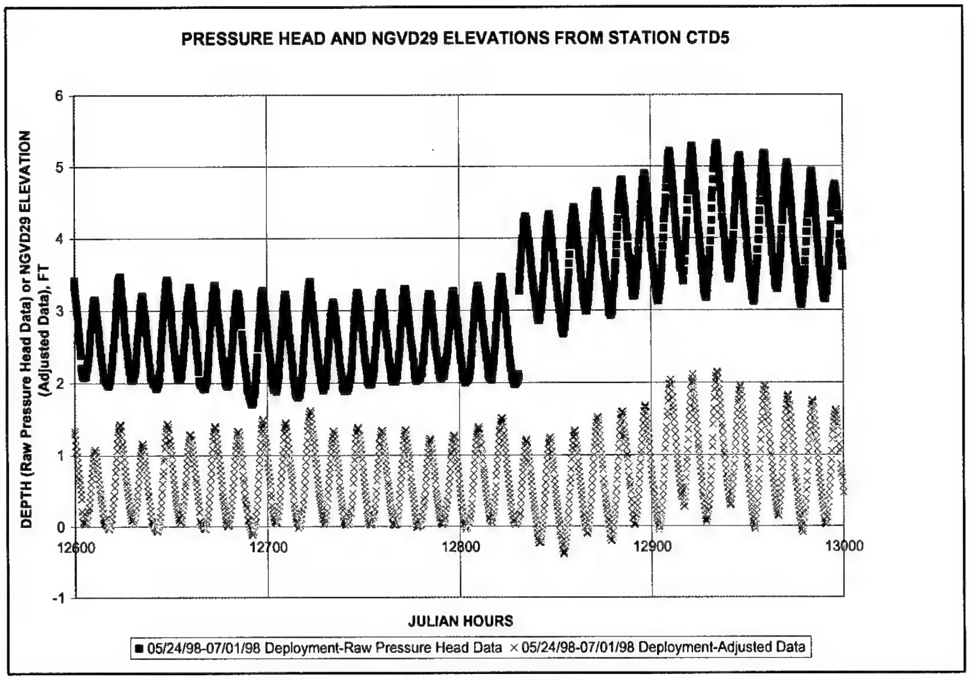


Figure 23. Raw (depth) data for CTD5 (above) showing where instrument floatation was lost and manipulated (NGVD29 elevation) data (below)

in extent and are not considered to compromise the data set. However, this potential problem is noted in Appendix D.

Additionally, in various instances water-surface elevation data exhibited an unusual data drift, probably due to fouling. Two particularly large instances of depth drift were in the CTD1 data. Figure 24 shows one of these drifts for the December 1997 to February 1998 time period. The top plot shows the raw depth data as measured by the sensor. The large gap on the right, in the upper plot of Figure 24 at about Julian hour 9800, is due, primarily, to a drift of the sensor values to higher values since its deployment at about Julian hour 8400. By approximating this drift as linear, the data, which otherwise looked good, were moved to fit with the data from the new, fresh meter installed at about Julian hour 9900. The lower plot shows the result of this manipulation and includes the adjustment to the NGVD29 datum and the correction for barometric pressure. The values near the zero depth line are part of the "before deployed or after retrieved" type data and serve to indicate the approximate time of the deployment. These values are removed from the adjusted data. Water-surface elevation drift manipulations will be discussed further in Chapter 4. Such large data drifts are usually associated with salinity measurements. Salinity values often exhibit drift due to biological fouling common in salinity measurements. Salinity data, however, are shown raw and without adjustment in every case. The salinity drift will be discussed in Chapter 4 also.

The water level records were also analyzed to characterize the principal tidal constituents and to quantify the response to wind forcing. These analyses are discussed in more detail in Appendix B.

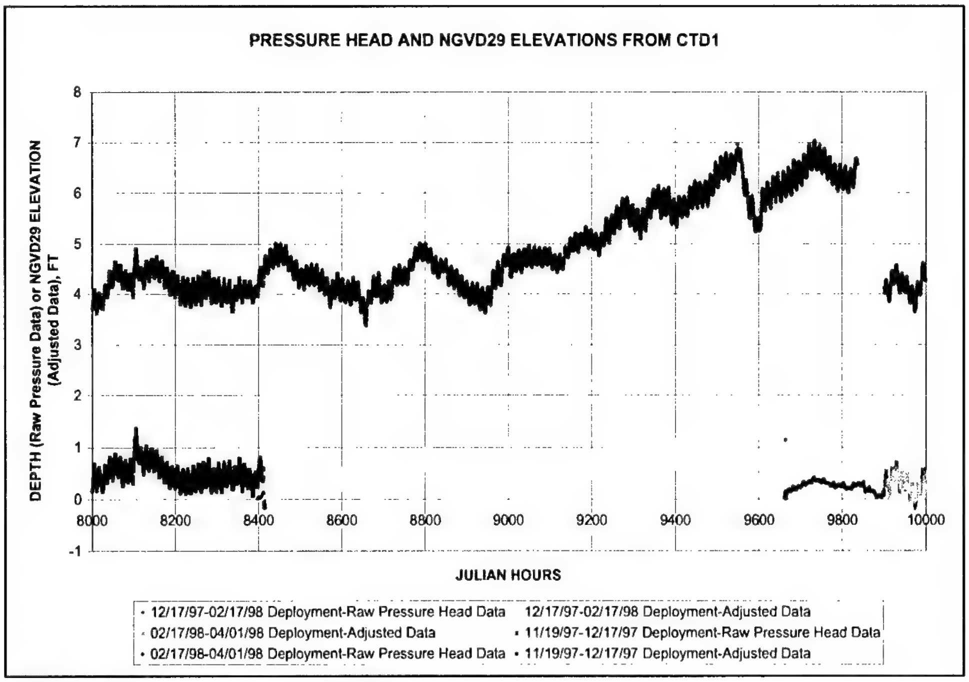


Figure 24. Drift of pressure head (depth) at CTD1 (above) and adjusted data (below)

Short-term BNP/CHL ADCP Velocity (Discharge) Data

The ADCP data presented herein consist of nine, more or less, channel crossings at each transect for, typically, an eight-hour survey period. These crossings were made to obtain discharge values across the transects defined at various inlets and channels in the Bay. Figure 5 shows the location of these transects. Tables 2-4 provide details of individual transect crossings and transect locations, and Tables 28-29 provide transect crossing by transect crossing results.

Obtaining these discharges was the primary goal of the intensive surveys. Transects chosen for the short-term intensive ADCP data collection effort were bounded by distinct "hard" boundaries, with the exception of Transect 8 (Safety Valve), to minimize inaccuracies of the discharge measurements. The discharge data from the various ADCP short-term intensive effort transects were obtained near or adjacent to several of the deployment locations of the CTD sensors. Plates 169-221 are the time-history plots of discharges and tides versus time for each ADCP transect location and the nearest or adjacent CTD deployment locations during the two short-term intensive surveys, where available. These plots permit seasonal and other comparisons for the tide/discharge phase and other relations.

Discharges obtained within the inlets or channels ranged from 100 to 50,000 cfs during the 14-16 October 1997 and 26-28 February 1998 periods. Transects 112 and 114 were repositioned as Transects 12 and 14, respectively, during the October 1997 survey for better representation of the flow through the sites and were not used in the February 1998 survey. The phase relation between tide and discharge for Transect 11 (Plates 178 and 205) only appears radically different from nearby transects (i.e., 180° out of phase) due to the definition of ebb and flow directions. See footnotes in Tables 28 and 29 for flow direction definitions.

Other, more detailed, data are available for ADCP surveys. For example, Plates 222-237 show representative depth-averaged plan-view vector plots of the ADCP velocity and direction data obtained during the short-term intensive survey data collection periods. These plates illustrate the vector magnitude and direction as geo-referenced to the GPS data. The magnitudes of the velocities are printed in text, and the scaled arrow represents the velocity direction. These Plates 222-237 can be compared with Plates 169-221 and Tables 28 and 29 to gain contexts in terms of tidal cycle and flow rate across the transect. More detailed data, showing the vertical and lateral current structure, are also possible products from the ADCP data. These are most useful for 3-D consideration of the flow structure.

4 Data Collection: Quality Discussion

This chapter provides a discussion of the usefulness, or quality, of the BNP/CHL data for use in understanding Biscayne Bay system hydrodynamic and salinity behavior. In this assessment of the data, it was also determined if corrections or other manipulations could be applied in such a manner as to enhance the usefulness of the data without diminishing its integrity. Such corrections were applied to the water-surface elevation data for the CTD tides only. Except for the intensive ADCP data, the discussions below concerning meter operations and other field-related issues have been inferred from the data transmitted to CHL by BNP, known characteristics of the instruments employed, and communications with BNP personnel. In brief, our assessment of the BNP/CHL data set is that it is a good data set and that it is suitable for use in the study and understanding of Biscayne Bay hydrodynamic and salinity behavior.

Long-term BNP/CHL Data Overview

Weather data

The weather data as presented in Table 9 were inspected and determined to be reasonable, accurate, and of sufficient quality and quantity for application in future uses. There were no obvious problems noted that would prevent the use of these data. The wind data, for example, were compared with those of the Fowey Rocks station and were found to possess a high degree of correlation. Such a high degree of correlation is unlikely to happen by chance, indicating the high quality of the Convoy Point wind data. An independent assessment (Appendix B) also found this high correlation.

The return of the data from the weather instruments was 100% with the exception of the cumulative rainfall parameter and the air temperature sensor, as discussed in Chapter 3. As necessary, such gaps in the data can be approximately filled by alternative sources of the data, perhaps correlated to the Convoy Point data, or by data filling techniques such as that discussed in Hsieh and Pratt (2000). No suspect data values were observed that would prevent any of the data being reported.

ADP velocity data

The ADP velocity data as presented in Tables 10-14 were inspected and determined to be reasonable, accurate, and of sufficient quality and quantity for application in future uses. There were no obvious problems noted that would prevent the use of the data available from ADP1, 2, 3, and 5. Due to a pressure sensor malfunction in ADP4, much of its data are of uncertain usefulness. The return of the data from the ADP velocity instruments was 100% with the exception of the water level data from ADP4, as discussed in Chapter 3, and data logging problems at ADP1 from 27 June 1997 to 1 December 1997, likely due to battery failure. The internal pressure transducer of ADP4 used to record water levels failed after the first month of the study. Several other problems were encountered with this instrument from 12 August 1997 to 15 November 1997. A more detailed account of the ADP deployments is presented in Appendix C. The other parameters of the ADP4 instrument, velocity and temperature, continued to operate and record data successfully but, as discussed earlier, the velocity values must be used with caution.

The February 1998 sample of the questionable ADP4 data is plotted in Plates 63-79. Plate 78 shows the anomalous depth readings. The other data, for the most part, do not stand out as obviously flawed, except as discussed below. The uncertainty in the locations of the near surface and middepth bins presents a problem, but the fact that the pressure gauge malfunctioned to such a large degree calls into question, at least at the outset, all of the instrument's data. The near bottom bin velocity data display a different type of anomaly, as seen from Plates 73, 74, 76, and 77. These strange results are also seen in the ADP5 data, Plates 90-94. These results may be related to the locations of the instruments (both were in or near the North Bay) or some obstruction that influenced the data from the deepest bin during the time period. The effect begins at both ADP's within a few days of one another (ADP4 on 2 February 1998 and ADP5 on 4 February 1998) but, though ADP5 appears to recover on 21 February 1998, the ADP4 anomalous data continue into March. The early February start date of this behavior corresponds with a significant blow in the Bay, as seen in Plate 1, also which could bear on the problem.

The velocity direction time history plots for the ADP stations presented among Plates 12-96 represent the directional variations of the resultant velocity as determined from the x and y velocity components (East is +x, and West is –x; North is +y, and South is –y.) and are not necessarily associated with the ebb and flood phase of the tides. For each of the ADP instrument locations in this study, no suspect data values were observed that would prevent any of the data being reported. Also, no estimates were made of any data that were not recorded by the ADP instruments.

CTD water-surface elevation and salinity data

The CTD water-surface elevation and salinity data as presented in Tables 15-26 were inspected and were determined to be reasonable, accurate, and of sufficient quality and quantity for application in future uses. There were no

obvious problems noted that would prevent the use of most of these data. Only one portion of the data, representing water levels for 6 June to 10 July 1997 at the TD7 location, was considered suspect. These data are discussed more in the next section. As discussed in Chapter 3, some manipulation was performed on the water-surface elevation data. These manipulations will be discussed in detail below and, in any case, do not detract from the usefulness or integrity of the CTD water-surface elevation data. Both raw and manipulated water-surface elevation data are discussed and available, however.

Salinity data are discussed at length later in this chapter. Briefly, however, no salinity data were manipulated, rejected, or discarded for any reason. Some of the salinity data experienced drift, however, and obvious outliers occur, generally associated with the deployment or retrieval processes. (When data were considered suspect, they were not included in averages, as discussed earlier.) The information presented in Tables 30 and 31 provide the data return summary for the 12 CTD instrument recording stations. Periods of gauge malfunction and percent of data returned are identified in these tables. Any break in the record of a meter is the result of an instrument sensor ceasing to operate properly or not being deployed.

Long-term BNP/CHL Water-Surface Elevation Data

General considerations

Each CTD instrument measured the pressure head above the instrument. To that end, each CTD instrument was outfitted with an internal pressure sensor. Figure 25 shows the tip, or nozzle, with a small 2- to 3-mm orifice through which the ambient water pressure was communicated to the internal pressure sensor. Data recorded from this internal pressure transducer were then converted to a distance (the pressure head). If the instrument is properly calibrated and the pressures are corrected for the ambient atmospheric pressure above the instrument location, the resulting distance is the depth of water above the internal sensor. The CTD automatically compensates for the density of the water (YSI, undated), using the salinity measured by the CTD itself. Since this salinity value is near the bottom, the water density will generally be overestimated and the depths thus underestimated on the order of 1% in estuarine (stratified) conditions. The corrections for ambient atmospheric pressure also included a correction for the salinity. The instruments were deployed "upside down," as shown in Figure 20 to minimize the trapping of debris. The instruments were thus placed with their sensors close to the bottom.

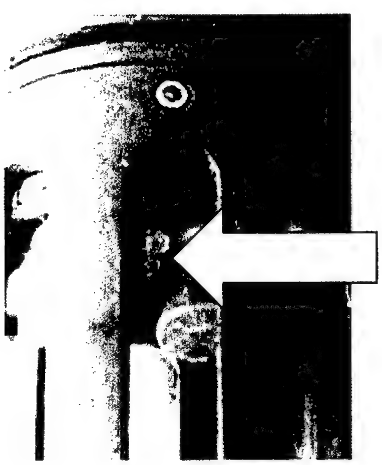


Figure 25. Near the center of the figure is the pressure sensor orifice, oriented downward

The range of the internal pressure sensors was such that, even if the float was lost and the instrument lay on the bottom, useful water-surface elevation data would be recorded. In fact, this happened twice. Recall Figure 23 and the discussion in Chapter 3. The shape of the tide (that is, the changes in the water-surface elevation) was still recorded and found to be useful. Resulting uncertainties in the exact elevation of the water surface from this (loss of float) and other causes, such as drift, do affect attempts to relate the data to a fixed datum, such as NGVD29. (Salinity data would only be affected by a float loss if the salinity were so highly stratified near the bottom of the Bay that a 30-cm (1-ft) change in elevation made a difference, which is discussed in the salinity section.)

Data offset

A general overview of the CTD tide data reveals a large, systematic offset of the raw data recorded during, approximately, the June through July 1997 period as compared to most of the remaining data of a particular location. The only exceptions are the CTD10 location, which was not occupied until 15 December 1997 and the CTD11 location, which may have suffered a lightning strike. (The log sheet states "YSI said it was lightning striking it that caused internal error.") This event at CTD11 caused the loss of the data before the 1 August 1997 redeployment when the offset is seen in the other sites.

The cause of this large, systematic offset appears to be in the calibration of the instruments. Calibration logs for the early period of deployment do not contain pressure or depth calibration information, but the raw data reveal a 30- to 60-cm (1- to 2-ft) offset of the "dry in air" reading of these meters before deployment. This is consistent with a note on one of the early calibration sheets that noted that the particular meter read "0.5 meter" (or about 19 in.) in the laboratory. After these initial few data collection periods, the "dry in air" values of the meters are approximately 0.0 meter as expected, and the calibration logs reveal pre- and post-deployment information consistent with the raw data "dry in air" values.

Figures 26 and 27 illustrate one of these offsets in a portion of the raw data for CTD12. Figure 26 shows the raw data for the first four data collection periods at CTD12, from about Julian hour 4000 (16 June 1997) to 6500 (28 September 1997). The six groups of isolated data marks (indicated by letters "a" through "f" in Figure 26), with three indicating about 30- to 60-cm (1- to 2-ft) depth and the other three at about 0-cm (0-ft) depth, mark the servicing periods. During a servicing event, the deployed meter is retrieved and replaced by another, similar instrument, with an overlap of data between the two meters, as discussed earlier, whenever possible. These groups of points, such as "a" through "f", provide an indication of the state of calibration of the CTD pressure sensor. Thus, the pressure sensors for the first two data collection periods for this CTD location were not calibrated to a zero depth when "dry in air." At the second servicing of this meter, right around Julian hour 5100 (1 August 1997), the calibration of the newly deployed meter was performed to a 0.0-m depth dry in air value. This second servicing can be seen in more detail in Figure 27. The predeployment period of the new meter can be seen in the approximately 0.0-ft depth values

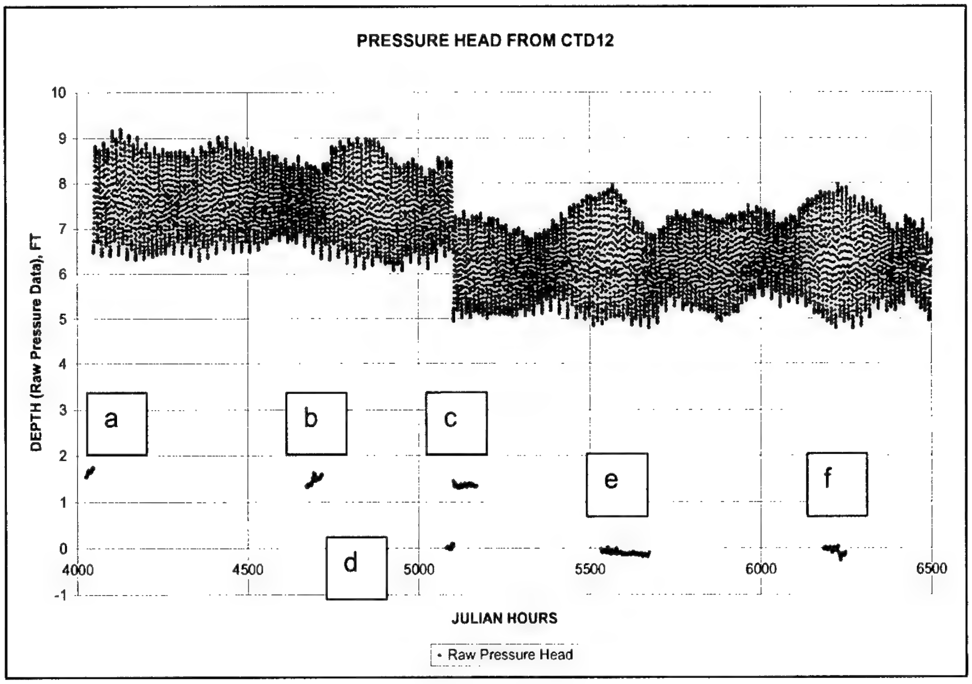


Figure 26. Calibration offset in CTD12 pressure head (depth) data for the first four deployments

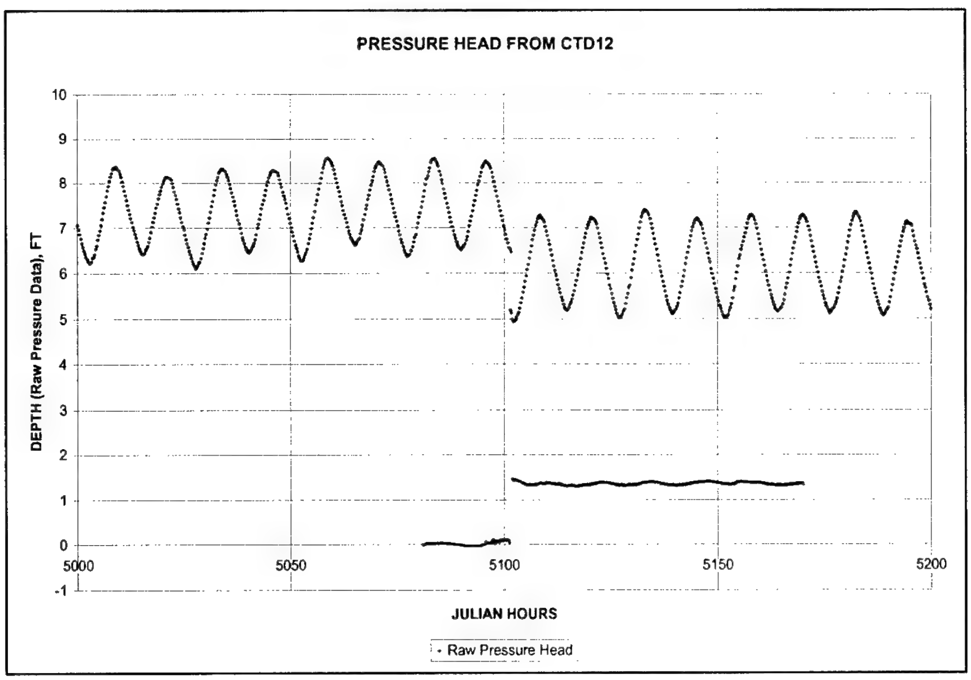


Figure 27. Detail of depth data at second servicing period for CTD12

preceding the 5100 Julian hour mark, and the approximately 45-cm (1.5-ft) depth for the old meter after retrieval is evident.

As is plain from Figure 27, however, the lack of the calibration does not render the early data unusable for the purpose of studying the Biscayne Bay system and developing a numerical model of the system. The data are only offset. Ideally, of course, the meters should be calibrated similarly, but a lack of perfection in this calibration can be remedied, for the most part, through a shift and an intelligent use of the data. This is because the range of pressure values over which the instruments give good results is large. So "starting at the wrong" reading matters for the absolute values, but not the changes in those values, and such relative readings can thus be corrected to more appropriate absolute values by a shift if enough information is available. Small offsets on the order of a few millimeters to a few centimeters are, in general, present in the data, in any case, due to different pressure sensor characteristics, differences in deployment configuration, variations in meter vertical position due to varying currents, and differing physical dimensions of the CTD devices.

A shift of the data was performed and is shown in Figure 28 for CTD8. The lower plot in Figure 28 is the shifted data. The amount of the shift was determined as the difference between the average value of the data before and after the shift event. As long a series of data as possible was used for these averages, and obvious outliers such as pre-deployment or post-retrieval values were not included in the averages or in the final "NGVD29" data sets. This shift is performed similarly to that already described in connection with Figure 23 for the float loss case at CTD5. In addition to CTD5, CTD3 appears to be a case of a float being

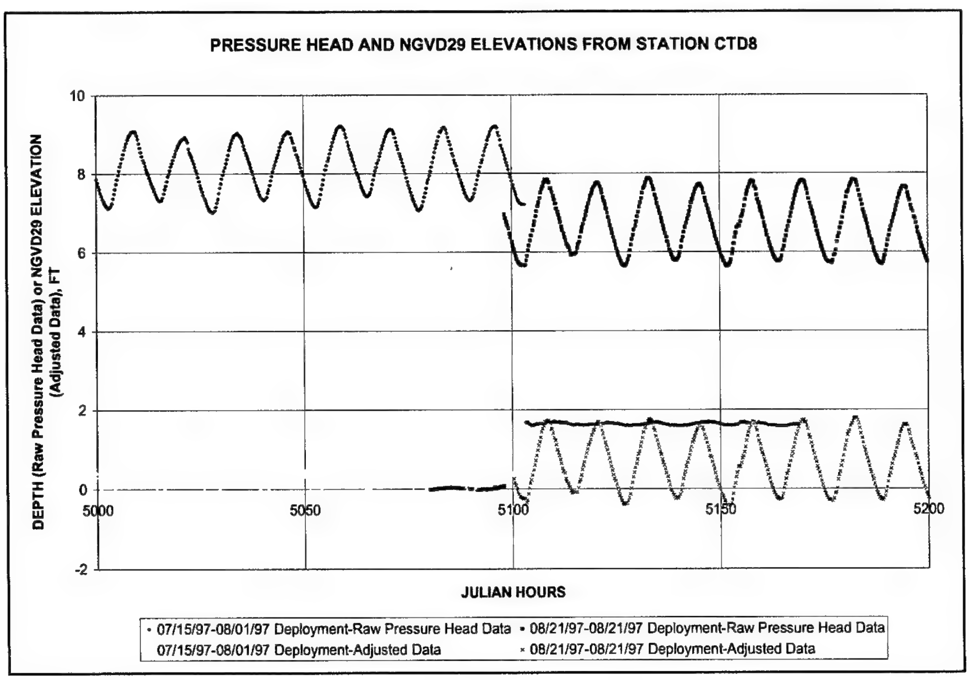


Figure 28. CTD8 raw depth data (above) and adjusted data (below)

lost and the pressure gauge settling to a deeper position. Such was noted in the calibration logs for CTD3. As discussed earlier, this use of equating data averages is simply a method of moving the two "mismatched" signals closer to one another, providing a more nearly continuous water-surface elevation signal.

These pieced together data sets will not necessarily meet in a continuous fashion even with the shift described here (and this shift is not intended to create a perfectly matched data set). This is due to several factors, one of the most significant being the fact that average values of finite portions of a tidal signal will not necessarily be exactly the same. Furthermore, the pressure sensors experience drift, the sensors differ from meter to meter, the meters are slightly different and, despite the great care taken during each redeployment, the deployment at a given site is not necessarily exactly the same from collection period to collection period. The gross shift that involves equating the averages provides the bulk of the needed shift, and it allows for the data to be used for its intended purpose. The end user may perform additional shifts as necessary, however, using the working hypothesis that the water-surface elevation at the site was continuous. For CTD4, Figure 29 shows a detail of the raw data (upper plot), with its overlap of data and pre- and post- deployment values, and the manipulated data (lower plot), showing the slight mismatch of the NGVD29 values that remains.

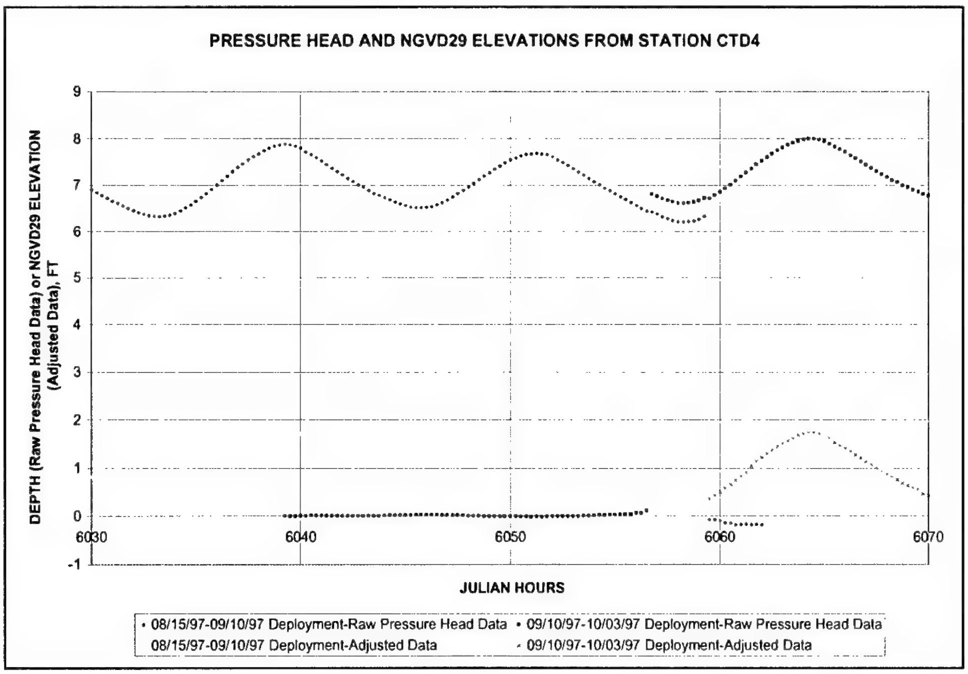


Figure 29. CTD4 raw depth and adjusted data with residual mismatch

Missing data

Some data are missing. CTD1, 2, and 8 have small gaps in the water level data, likely due to instrument failure. Figure 30 shows such a gap at CTD8 during late March 1998, with the raw data above and the manipulated data below. The

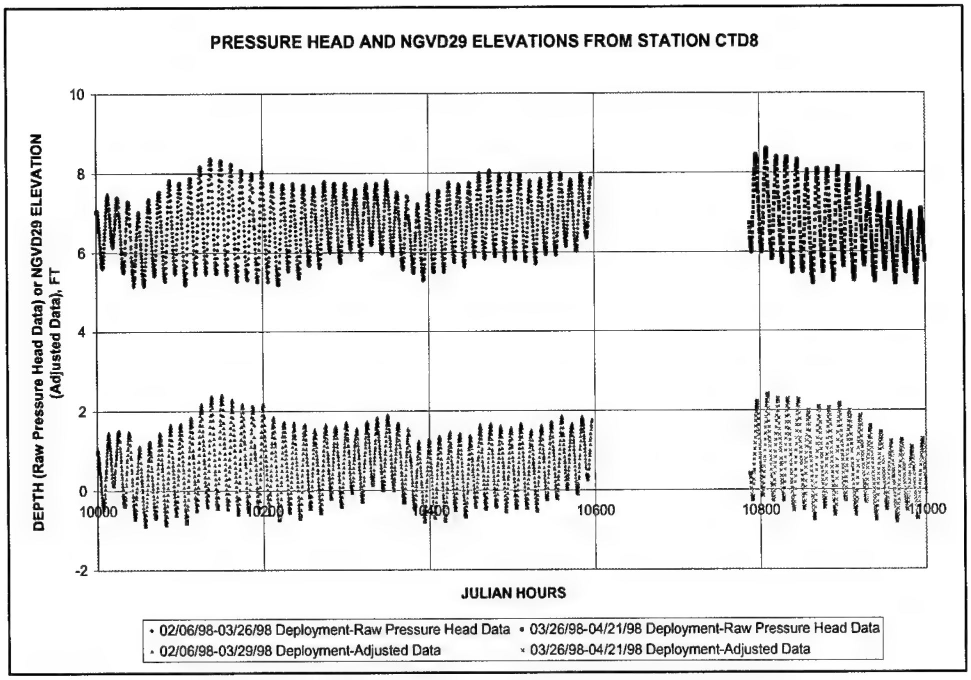


Figure 30. Large data gap for CTD8

gap is approximately 200 hours, or 8 days. CTD3, 4, 5, 7, and 11 have larger gaps approximately the size of a deployment period. Figure 31 shows a large gap in the CTD11 data. Note the catastrophic failure at about hour 8000, which is the depth record version of the failure.

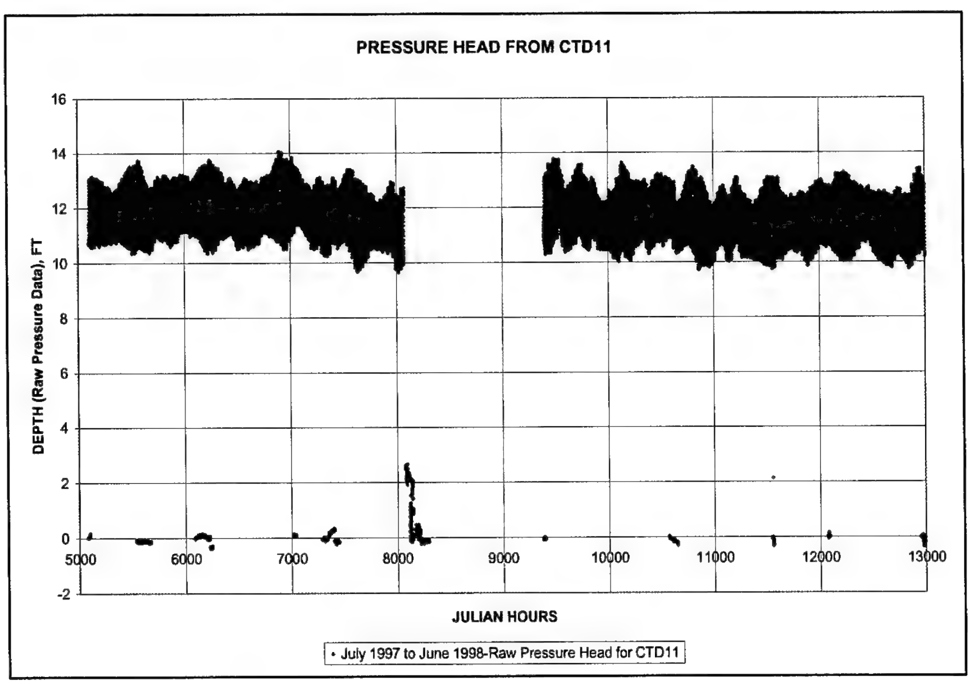


Figure 31. Large data gap for CTD11 with failure

Figure 31 can be compared to the salinity data presented in Figure 22 for the same CTD. CTD6, 9, 10, and 12 have complete, or nearly complete, data returns, with no obvious gaps. More details will be discussed in the meter-by-meter discussion to follow.

The only water-surface elevation gap present because collected data were not reported is that from 6 June to 10 July 1997 for CTD7. These data were rejected due to the one- to two-order of magnitude disparities between the site depth and the reported meter depths. Inspection of the calibration logs indicates a general distressed situation for the meter at this initial deployment at the CTD7 location. Aside from this particular instance, however, missing data as represented in the plots or data sets are just that: the instrument did not record anything for the parameter in question in these gaps. Periods of missing water level data, which were evident from the time history plots, are identified in Table 30.

Data drift

Drift in the water-level data is not considered to render the data useless unless the reported values are noted as unrealistic (e. g., depth of deployment recorded is 1 m (3 ft) and the depth reported by the instrument is 15 m (50 ft)) or the drift appears to be too nonlinear. The majority of the water level data did not appear to be much affected by biological fouling and major drift problems, and the major drift cases lend themselves to a linear treatment.

For example, Tables 32 – 43 provide depth calibration information, and Table 44 summarizes this information in terms of data drift. From Tables 32 – 43 it can be seen that for the most part the instruments were well calibrated and further calibration checks were made. (For example, after calibrating a CTD to read 0.0-m depth when "dry in air," the instrument was placed in a 0.5-m bath to check its reading.) These numerous calibrations and checks make accounting for the small number of uncalibrated cases that much easier by demonstrating the robustness of the depth sensors with respect to their calibration from beginning to end of most deployments.

The mean drifts are on the order of a few centimeters, with a few maximum drift values on the order of a few 10's of centimeters, constituting a "major" drift. If the magnitudes of the water level fluctuations (*i.e.*, peak-to-peak values) were determined to be consistent with those from a previous deployment record, then it was considered appropriate to determine the rate of drift and use that information to adjust the values of the levels of the drifting water level data points. Implicit in the methods discussed below for removing the drift from the signal is the assumption that simple assumptions for drift linearity are sufficient to adjust the data and make it more useful for the modeling exercise. The raw data, however, are included on the data CD for perusal. The slope of the drift was determined by using values of the pre-drift data, the post-drift data, and the drifted data. This slope was then used to "de-drift" the data. If appropriate, the mean value of the de-drifted data was also adjusted similarly to the float loss and calibration situations discussed earlier.

Two data drift occurrences were deemed large enough to be corrected in the CHL data analysis effort. Both were part of the CTD1 data set, and each required a slightly different approach. Figure 24 shows the first segment of drifted data that were corrected for drift. The "Total Drift" (or net drift) for this segment was determined by the following equation:

$$\text{Total Drift} = \text{Mean of the Drifted Data} - (\text{Mean of Data in the Preceding Period} + \text{Mean of Data in the Following Period}) / 2$$

The "Mean of the Drifted Data" is the mean of the last, approximately, ten days of the drifted signal data in this particular portion of the data. This segment was chosen because of its apparent flat, stationary appearance, and its mean was chosen to represent the effect of the drifting on the data. The arithmetic mean of the means from before and after the period of drift was chosen to represent the value of the mean from which it is assumed the drifted data departed.

This estimate of the drift of the signal was then used in an equation to estimate a corrected set of water-surface elevations for the period in question. The equation used for the data in Figure 24 for CTD1 was

$$\text{New Water Level Value} = \text{Old Water Level Value} - \frac{\text{Total Drift}}{\text{Max Time of Deployment}} \times \text{Time of Water Level Value}$$

The "Time of Water Level Value" is the time since the start of the beginning of the drifted data set. This equation assumes that the drift is linear. The lower plot in Figure 24 is formed with this equation and, despite the data gap between hours 9800 and 10000, the match of the de-drifted and the following segment is seen to be good. "Max Time of Deployment" is the total time the signal had to drift during the deployment.

When applying this type of correction to the water-level elevations, the local variations in the water level data are not affected. Therefore, the effects of any anomalies, such as wind-induced changes in mean water levels, are not obscured by this correction technique. An example of wind-induced effect can be identified for the period 3 to 5 February 1998, or around Julian hour 9600 in Figure 24. This setdown is seen in other tide signals of the BNP/CHL data set (i.e., at other CTD stations) and is caused by the strong winds seen in Plate 1 for the time period. The de-drift process preserves this signal.

A different approach was used to de-drift the other obviously drifted water level signal from CTD1. This signal also has to be adjusted for a datum shift. Figure 32 shows the raw data in the upper plot. Except for the data points on the far right of the plot, with values around 1.2 m (4 ft), the plot shows the data set for a particular meter deployment. The instrument deployed in the earlier period failed before the servicing period indicated between Julian hours 10,900 and 11,000. The time series has two gaps that require attention. Between Julian hours 11,000 and 11,100 is a gap that indicates a datum shift not unlike that of the float loss shifts seen earlier. The instrument appears to have been forced lower in the water column, registering a few inches of increased water depth. The cause of this

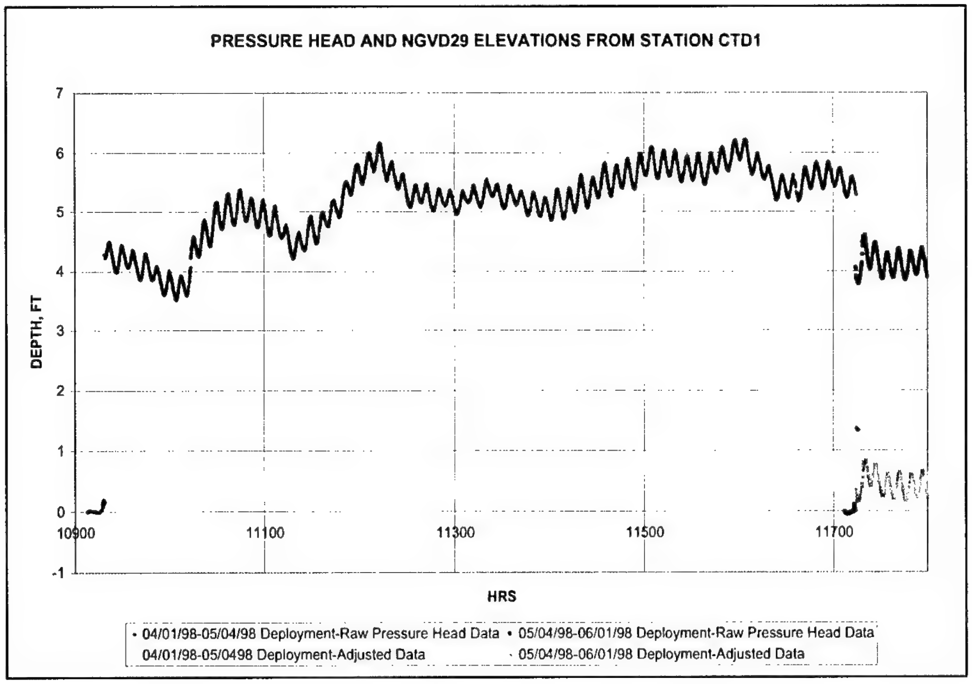


Figure 32. CTD1 raw depth data and elevations adjusted for barometric pressure, drift, shift, and NGVD29 datum

shift is unknown. The drift can be seen in the large gap at the end of the time series, after the Julian hour 11,700.

This drift and the shift can be handled together by developing linear expressions for the drift of the shifted signal and for the line connecting the point immediately before and after the shifted and drifted data points. The difference between these two expressions is the amount of change needed to correct the data for both the shift and the drift. For example, if T is the time of a given data point ("Time of Water Level Value" in previous drift discussions for CTD1) relative to the beginning of the uncorrected data set, then the line connecting the first and last points of the raw data of the uncorrected (drifted) data set can be written as

$$Y = A \times T + B$$

where A is the slope of the line, determined from the first and last data points and the time interval involved, and B is the initial value. The line connecting the two points just before and just after the data set is similarly written as

$$Y_1 = A_1 \times T_1 + B_1$$

A_1 and B_1 are defined similarly to A and B, and $T_1 = T + 0.25$ hour to account for the fact that B_1 occurs 0.25 hour earlier than B. In this case A_1 is $O(10^{-4})$ and the resulting difference is small. The correction Z to the original values is, then

$$Z = Y - Y_1$$

And the new values Y_{new} are calculated from the original values Y_{old} by

$$Y_{new} = Y_{old} - Z$$

This correction is evident in the lower curve of Figure 32.

Different approaches were used for these two cases because a single approach did not produce satisfactory results for both. Such corrections must be tailored to the individual characteristics of the given data set, and a trial-and-error approach is usually advised to find the best approach, especially when the drift is large. In fact, drift was present in most of the data. Because we assume that the water-surface elevations were continuous these drifts can be corrected at the discretion of the end user.

From Tables 32 – 43 it is seen that the drift of the depths, as determined from the post-deployment readings, ranged from 0.000 m (Table 33, CTD2 deployment number 13, for example) to 0.573 m (Table 32, CTD1 deployment number 10). The drifts are both positive and negative, but their magnitudes are generally one or two orders of magnitude lower than the 0.573 m figure for CTD1. Table 44 shows the mean absolute drift and the largest drift reported for each CTD location. From this is seen that the mean absolute drift ranges from 0.120 m to 0.041 m and the largest drifts range from 0.573 m at CTD1 to 0.056 m at CTD4 (considering absolute values only). Except for CTD9, every largest drift that was greater than 0.100 m was positive. The largest systematic drifts (CTD1 with 0.573 m (and 0.383 m), CTD3 with 0.223 m, CTD6 with 0.216 m, CTD12 with 0.330 m and, possibly, CTD10 with 0.159 m), related perhaps to a fouling mechanism, are associated with positive drifts. A positive drift is consistent with the lodging of a hard organism at the face of the pressure sensor and subsequent growth that pressed on the sensor and caused the sensor to indicate a higher pressure and, thus, a greater depth above the sensor than would otherwise be recorded. This would also be expected to be a progressive effect as seen in, for instance, CTD1, deployments 9 and 11.

The drifts in Table 44 are those derived from a comparison of the pre- and post-deployment calibration and calibration checks for the sensors dry in air. Often the CTD's were not deployed for some time after the calibration and were not tested in the laboratory for some time after retrieval. Examination of the periods of time that represent the intervals between laboratory checks and deployment indicates that some of the drift may be the result of activity outside the water. These drifts, however, appear to be small and not a significant factor in the drift of the sensors.

Barometric pressure

The raw pressure heads, even when adjusted for any calibration or drift problem, also contain the effects of the air pressure above the water column. If the atmospheric pressure is higher than that for which the pressure sensor was calibrated, then the sensor will register a pressure too high for the water above it; that is, the water depth will be reported too deep. And conversely, if the atmospheric pressure is lower than that for which the sensor was calibrated, then the sensor will register a pressure too low for the water above it, and the sensor

will indicate a depth that is too shallow. The pressure at the Convoy Point weather station was used to correct for these barometric pressure offsets. A correction, based on the extent to which the Convoy Point pressure reading was over or under the calibration pressure of the sensor in question and the salinity measured by the CTD, was calculated and applied to the sensor reported pressure.

At CTD1, for example, the pressure difference and salinity led to depth corrections on the order of +0.1 ft on the average. The maximum correction was +0.39 ft, the minimum was –0.09 ft, the average was 0.12 ft, and the standard deviation was 0.10 ft, all rounded to two significant figures. The exact equation used for the corrections to the pressure head due to barometric pressure variations was

$$DC = D + (2.770893 \times H)/(0.0457 \times S + 62.39)$$

where D = CTD depth reading in feet (pressure head), DC = barometric pressure compensated depth in feet, H = change in barometric pressure in mm Hg (CTD calibration barometric pressure less Convoy Point weather station barometric pressure), and S = salinity. When salinity was not available, S = 15 was used, introducing an error of no more than 0.01 ft (Lynch 1999).

NGVD29 datum

Except for the CTD10 location in the mouth of the Miami River, all CTD stations were surveyed for elevation. The actual surveys resulted in elevation of the pressure transducer of each surveyed CTD with respect to the NGVD29 datum. These elevations were then added to the barometrically corrected pressure head (water depth) from the CTD to yield the elevation of the water surface at the location with respect to the NGVD29 zero. Table 1 provides the transducer elevation for each surveyed instrument. Since the NGVD29 datum zero is, generally, within about one foot of mean lower low water (MLLW) in Biscayne Bay, these transducer elevations provide a rough guide to the depth of the water at the deployment site. The elevations reported as the lower plots in Figures 23, 24, 28, 29, 30, 32, and 33 provide samples of the data as corrected for all of the aspects discussed heretofore. In these figures, the lower plot is the "corrected" water-surface elevation data, and the zero of the vertical (depth) axis for this lower plot refers to the NGVD29 zero. The upper plot in these figures is a plot of depth (uncorrected for barometric pressure, calibration, or drift) above the pressure sensor, and for these data the vertical axis zero is interpreted as "zero depth (uncorrected) of water above the transducer."

At the time of the original establishment of the NGVD29 datum, the NGVD29 datum was considered to have its zero near the MLLW mark. MLLW water is different everywhere, however, so such a goal can only be exact for one place, in general, and for only a time since MLLW changes over time. It would be expected, however, that there would still be a correlation or connection between the MLLW datum and NGVD29 datum. That is, unless there have been large differential elevation changes over the Biscayne Bay system, it would be expected that MLLW and the NGVD29 datum (zero) would still be close to one

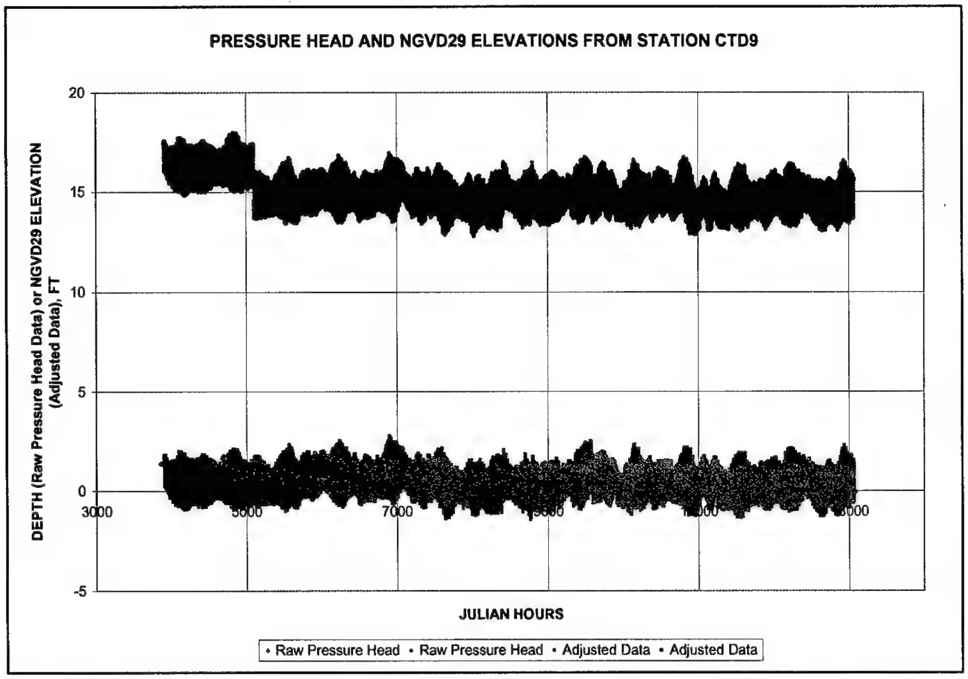


Figure 33. Raw depth and adjusted elevation (NGVD29) data for CTD9

another in Biscayne Bay. When the raw depth data are referenced to the NGVD29 datum, it is seen that the NGVD29 zero is close to the MLLW values of the data. Figure 33 for CTD9 shows the movement of the data (depth of water above the sensor) to the NGVD29 datum and the closeness of this to the MLLW datum. The MLLW value, for example, for the lower time series in Figure 33 is the average of the lower of each day's tide level for each day in the series. By inspection, this MLLW value (for the CTD9 data in the lower plot of Figure 33) is at approximately –30 cm (-1 ft) on the plot, or about 30 cm (1 ft) below the NGVD29 zero. The adjusted data therefore indicate a MLLW value for the CTD9 water-surface elevations about 30 cm (1 ft) lower than the NGVD29 zero. In the following paragraphs the locations in and near Biscayne Bay for which a relationship between local MLLW and NGVD29 is known will be discussed, and it will be seen that this 1 ft elevation difference between MLLW and NGVD29 in the BNP/CHL data is reasonable.

Though a given point can be surveyed to give an elevation in terms of, for example, the NGVD29 datum of various benchmarks, MLLW is not simply related to this or any other terrestrial datum. Only a handful of points in the Biscayne Bay region have a NGVD29 and MLLW relationship specified. By looking at these points and comparing the relationship between the various datums at them to our surveys, one can make a judgment about the reasonableness of the NGVD29 adjustments reported herein.

Figure 34 presents the locations of tidal benchmarks in the Biscayne Bay area from the NGS websites, *http://www.ngs.noaa.gov/cgi-bin/ngs_opsd.prl* and *http://www.co-ops.nos.noaa.gov/benchmarks/8723423.html* for example, and it

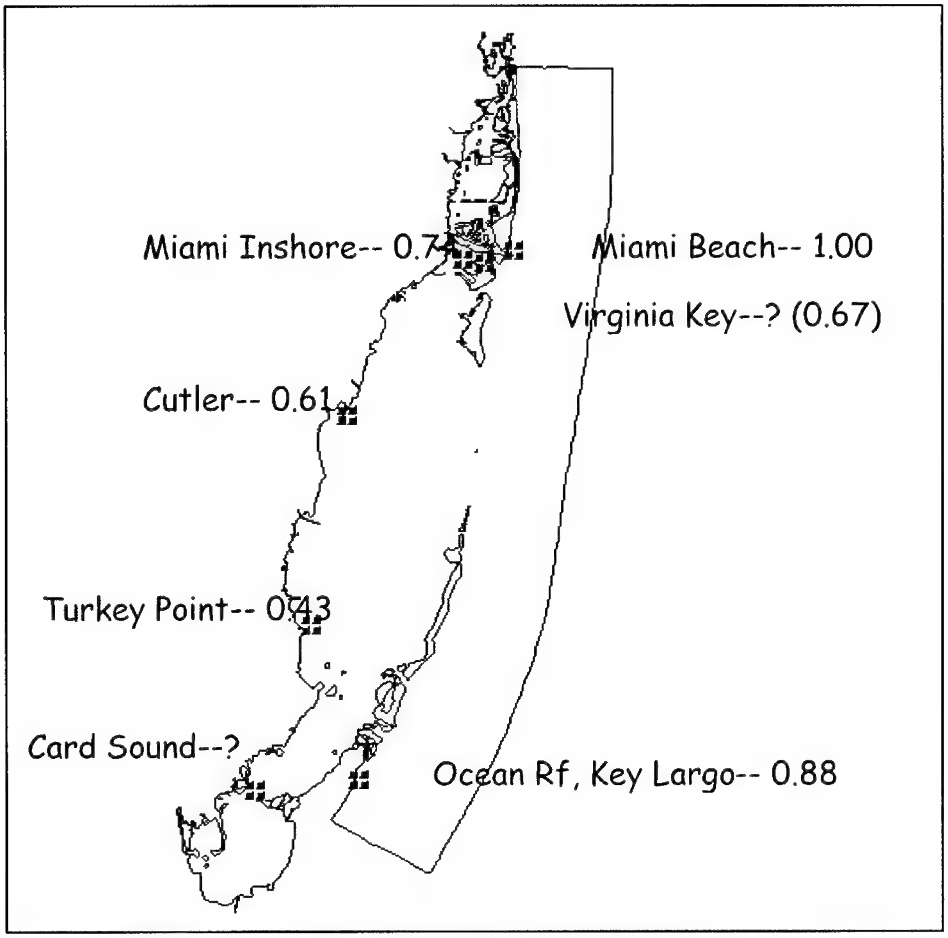


Figure 34. Sites with potential relationships between NGVD29 and MLLW

contains the elevation of the NGVD29 above MLLW in feet. The question marks denote that the elevation is not known reliably (Card Sound) or that it was calculated from the available NGS data by CHL but is not reported on the NGS website. These locations were surveyed in, using multiple local benchmarks, so that the location could be reestablished if destroyed. The data used to determine the various benchmarks at the locations are available, also. The benchmark information is reported on the website only if the calculations of the elevations for the (nominally) five local benchmarks do not vary very much. For example, the NGVD29 elevations of the Turkey Point locations vary from 0.41 to 0.43 ft over the five local benchmarks. This is considered a good elevation.

The trend is for the elevation of NGVD29 zero above local MLLW to diminish from north to south. This occurs both inside the Bay and outside the Bay. For example, the Miami Beach value is 1.00 ft, and Ocean Reef Key Largo is 0.88 ft on the outer beach of the barrier keys. Inside the Bay, the values run from the Miami Inshore and Virginia Key values of, respectively, 0.74 ft and 0.67 ft, to Cutler at 0.61 ft and Turkey Point at 0.43 ft. Comparisons can be made with the NGVD29 water surface data from the surveyed CTD sites. Estimates from examining the plots of the data yield a value on the order of 15 cm (0.5 ft)

for the elevation of the NGVD29 zero over the MLLW of the data for all CTD sites except the three in the extreme southern portion of the Bay, and perhaps CTD5 and 6. More precise estimates are developed below, but the trend is that the various central and northern Bay NGVD29 results for water surface values are reasonable in light of what we know about the regional benchmarks.

The southernmost sites, CTD1, 2, and 3, are estimated to have a value for the difference between the NGVD29 zero and MLLW of, approximately, -15 cm (-0.5 ft). This means that the MLLW is higher than the NGVD29 zero as judged from the data sets and their surveys. Unfortunately, no NGS relation between the NGVD29 zero and MLLW is available for this portion of the Bay. Assuming the NGVD29 references and the surveys for these sites are good, however, the interpretation could be that the water of Barnes and Card Sounds is perched with reference to the remainder of Biscayne Bay. Perching is seen in a temporal sense in all the data sets, with the possible exception of CTD9. For example, during the last half of 1997, the tides have a higher mean value than for the first half of 1998. This is especially true in CTD1, 2, and 3 data, and accounts for some, but not all, of the difference between these stations and the remainder. A similar seasonal perching is seen in Florida Bay (Schomer and Drew 1982). As indicated above, the NGS reported NGVD29 and MLLW difference does decrease in the southerly direction, and it is possible that the difference changes enough to invert the two references. Given the reasonableness of the other eight CTD stations, the elevations of the southern regions of the Bay may very well be this different in character and bear further investigation. The surveys of the remote Barnes Sound stations could be wrong, however, so a repetition of the survey of these stations would be advisable.

The following tabulation summarizes the differences (Diff) in feet of the CTD NGVD29 datum above (+) or below (-) the MLLW datum (as calculated from the available data in the June 1997 to July 1998 as corrected and related to NGVD29):

CTD	1	2	3	4	5	6	7	8	9	10	11	12
Diff	-0.46	-0.80	-0.51	+0.41	-0.01	+0.22	+0.50	+0.48	+0.70	NA	+0.59	+0.41

As discussed earlier, CTD's 1, 2, and 3 differ enough that a repetition of the survey may be in order. CTD's 4, 7, and 8 are consistent with the nearby NGS Turkey Point (+0.43) and Cutler (+0.61) survey sites. CTD's 5 and 6 are low and may also bear reexamination. CTD's 11 and 12 are of similar magnitude to the nearest NGS sites of Miami Inshore (+0.74) and Virginia Key (+0.67). And CTD9 is +0.70, which can be compared to the nearest NGS sites of Miami Inshore (+0.74), Virginia Key (+0.67), Miami Beach (+1.00), and Cutler (+0.61). Sea level rise in the Biscayne Bay area is reported to be approximately 0.70 ft since the NGVD29 datum was established (Burzycki 2000). The 0.67 ft Virginia Key and the 0.70 ft CTD9 offsets, both at the ocean near Miami, are consistent with this change.

Conclusions

It is rare to see a surveyed elevation data set over such a large area as this. It is even more rare to have nearby relations between MLLW and the terrestrial datum (NGVD29, in this case). This data set thus constitutes an extremely useful and robust characterization of the water-surface elevations of the system. The imperfections discussed here serve to suggest ways to improve on future data efforts, and they do not diminish the usefulness of the water-surface elevation data herein described for use in model development.

CTD water-surface elevation details

More detail of the CTD water-surface elevation data and their collection are given in the following discussions. Tables 45 – 56 detail the tidal data limits and deployment information, including the overlap of the instruments' pressure head (depth) data.

CTD1: For deployments on 6-6-97, 7-8-97, and 7-18-97, no pressure sensor calibration for pre- or post-deployment is indicated on the log sheets. The sheet for the 7-18-97 deployment mentions a calibration depth, 0.460 m, and an atmospheric pressure. This is consistent with the calibration deduced from the data for this deployment period. The 10-22-97, 11-19-97, and 2-17-98 deployments were calibrated more than a week before deployed. The data were adjusted for calibration shifts, barometric pressure, drift, and NGVD29. The first six months of the data indicate a seasonal perching of the water levels likely resulting from long-term tidal effects, local structural effects, and seasonal weather patterns. Aside from the two large drifts that were corrected, the 12-17-97 and 4-1-98 deployments, the other apparent drifts in depth were less than 7 cm, with some essentially zero. Drifts were both positive and negative.

CTD2: For deployments on 6-11-97, 7-8-97, and 7-18-97, no pressure sensor calibration for pre- or post-deployment is indicated on the log sheets. The 10-22-97, 11-19-97, and 2-17-98 deployments were calibrated more than a week before deployment. The CTD deployed on 12-17-97 was not running during its recovery, and the 6-1-98 deployment was calibrated during a power failure that raised laboratory temperature. The largest drift was 7.2 cm, and others were smaller with some essentially zero. Drifts were both positive and negative.

CTD3: For deployments on 6-6-97, 7-1-97, and 7-18-97 no pressure sensor calibration for pre- or post-deployment is indicated on the log sheets. The sheet for the 8-5-97 to 8-26-97 period is missing. The 11-19-97 deployment was calibrated on 11-10-97. The 12-17-97 deployment data end on 1-24-98, well short of the 2-18-98 retrieval date. The CTD used in the 2-18-98 deployment was found lying on its side; its float was broken. The largest drift, 22.3 cm, was associated with the broken float deployment, 2-18-98. The largest of the other pressure head drifts was -8.0 cm. Drifts were both positive and negative.

CTD4: For deployments 6-6-97 and 7-10-97 no pressure sensor calibration for pre- or post-deployment is indicated on the log sheets. The 6-6-97 deployment

had algal growth noted, and it was started at an odd time (17:11:13). The CTD used for the 12-8-97 deployment failed immediately after installation. The largest drift was -5.6 cm. Drifts were both positive and negative.

CTD5: For deployments on 6-6-97 and 7-10-97 no pressure sensor calibration for pre- or post-deployment is indicated on the log sheets. A note on the 7-10-97 deployment log sheets says the depth reads 0.500 m in the laboratory, implying a half-meter offset that is consistent with the recorded data. The 6-6-97 deployment suffered flooded batteries and yielded only six days of data. The 5-24-98 deployment ended with the CTD found lying on its side and its float missing. The largest drift value was 8.2 cm. Drifts were both positive and negative. Some of the pressure head data at low water periods appear flattened. This may be due to slack coming into the float line when water levels are very low.

CTD6: For deployments on 6-6-97 and 7-10-97 no pressure sensor calibration for pre- or post-deployment is indicated on the log sheets. This location resulted in uneventful deployments. The largest drift was 21.6 cm; the next largest was 8.9 cm. Drifts were both positive and negative.

CTD7: For deployments on 6-6-97 and 7-10-97 no pressure sensor calibration for pre- or post-deployment is indicated on the log sheets. For the 6-6-97 deployment it is noted that "all parameters were off." The 8-15-97 deployment ended with a lost CTD. The note says the "unit was ripped out. Probably a shrimp net hit it." The largest drift was 10.3 cm. Drifts were both positive and negative.

CTD8: For deployments 6-12-97 and 7-15-97 no pressure sensor calibration for pre- or post-deployment is indicated on the log sheets. The instrument deployed 2-6-98 appears to have malfunctioned on 3-18-98, resulting in an eight-day gap in the water-surface elevation data. The largest drift was 7.6 cm. Drifts were both positive and negative.

CTD9: For deployments 6-12-97 and 7-15-97 no pressure sensor calibration for pre- or post-deployment is indicated on the log sheets. The site was next occupied on 8-1-97. Fouling was noted on the DO membrane of the CTD. In and of itself this is not relevant to the depth measurements. The largest drift was -10.9 cm. Drifts were both positive and negative.

CTD10: This CTD site was occupied first on 12-15-97. All deployments were calibrated for depth. The largest drift was 15.9 cm, and the drifts were both positive and negative.

CTD11: For deployments 6-11-97 and 7-14-97 no pressure sensor calibration for pre- or post-deployment is indicated on the log sheets. The 7-14-97 deployment instrument stopped 7-26-97; the log sheet message says "lightning strike." The 8-19-97 deployment had "heavy fouling." The 11-6-97 deployment was recovered adrift at the South Beach Jetty; it came loose from its mooring on 12-5-97. The 12-10-97 deployment was recovered at RSMAS on 6-29-98. The 5-19-98 deployment is noted as having "growth" and the 6-24-98 deployment had heavy barnacle growth. The two largest drifts were for the ill-fated CTD's that

were recovered away from the site. The values were 8.7 cm for the 11-6-97 deployment and 9.6 cm for the 12-10-97 deployment. Drifts were both positive and negative.

CTD12: For deployments 6-18-97 and 7-15-97 no pressure sensor calibration for pre- or post-deployment is indicated on the log sheets. Barnacle growth is noted on the log sheets for the 6-18-97, 7-15-97, 9-15-97, 3-19-98, and 5-19-98 deployments. Fouling is mentioned on the DO membrane for the 12-10-97 deployment. And shrimp are noted as "living inside the conductivity hole" for the 3-19-98. See Figure 35. No log sheet was available for the 8-1-97 to 8-19-97 period. The largest drift was 33.0 cm for the 5-19-98 deployment. Drifts were both positive and negative.

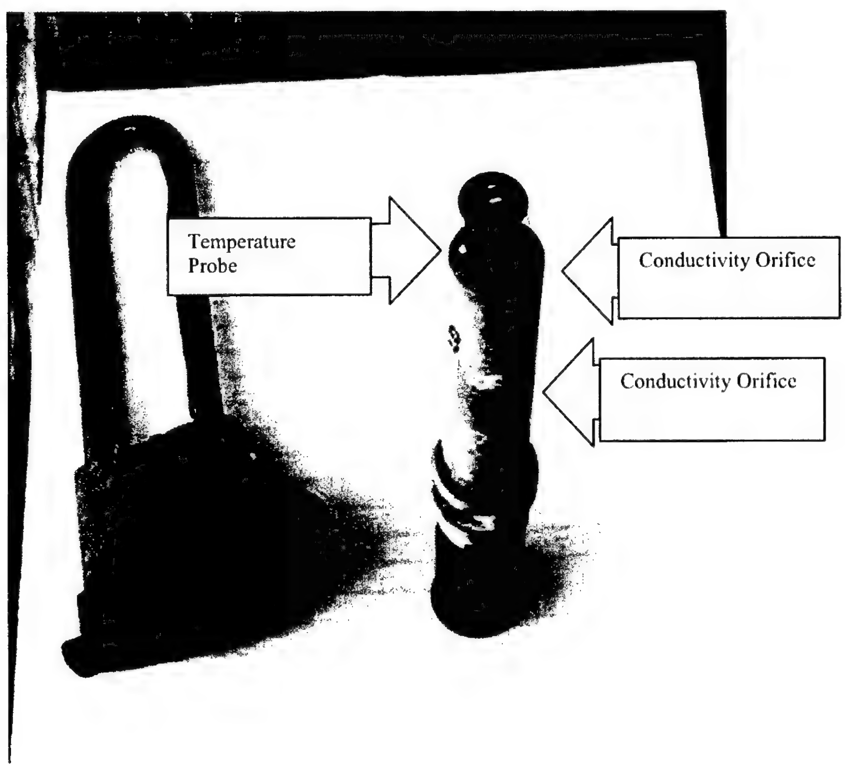


Figure 35. CTD conductivity and temperature probe (right) and lock (left)

Long-term BNP/CHL Salinity Data

General considerations

The CTD's also recorded temperature and conductivity of the water, from which salinity was calculated internal to the meter. Figure 25 shows the slotted cowl that contains the CTD probes. Figure 35 shows the temperature and

conductivity probe. The red cover in Figure 35 covers a fitting that attaches the probe to the seating inside the cowl, next to the pressure orifice shown in Figure 25. In Figure 35 the silver-colored knob is the temperature probe and the conductivity orifices shown allow water to move over electrodes for the conductivity measurement. The temperature and conductivity measurements are thus taken a little lower in the water column than the pressure reading, and the temperature and conductivity measurements themselves are not taken at exactly the same place. Finite-sized instruments are limited in precision. Deployment details for the CTD's were discussed earlier in the water-surface elevation data section. A lock used to secure the CTD's to the bottom pins is also shown in Figure 35. See also Figure 21.

The main problems associated with the reliability of the salinity data involve instrument failure of one kind or another, instrument movement, and fouling. The instrument failures were often associated with the concomitant failure of the pressure sensor, usually due to a systemwide failure of the CTD. These failures are the main reasons for missing data. Instrument movement occurred in the instances already detailed in which the float was missing or damaged and the CTD sank and lay on the bottom or in which the instrument became untethered and moved away from the deployment site. Movement, assumed negligible, also occurred in response to ambient currents. Fouling is the most common problem with salinity instruments. The overlap in data collection achieved by deploying two instruments, the to-be-retrieved one and the newly deployed one and the post-deployment calibration checks, allow assessments to be made in the salinity fidelity of the instruments as well as the pressure/depth readings. Tables 57 – 68 show this overlap in terms of salinity measurements. Conductivity, temperature, and salinity checks and calibration also contribute to the accuracy of the data and its interpretation.

Missing data

As with the water-surface elevation data, some of the salinity data are missing. Only CTD9 and CTD10 have a complete record. The data gaps are detailed in Table 31. Figure 36 shows CTD4 with its three large and one small data gaps. Tables 57 – 68 also provide information relevant to the deployments and data gaps. These gaps are not necessarily at the same times, in every case, as the water-surface elevation data gaps.

Salinity data are missing for two reasons. Sometimes the meters did not report temperature or conductivity because of some failure or the meter was not deployed. Salinity cannot be calculated without both quantities. Sometimes conductivity and temperature are both reported but, for some reason, the instrument does not go on to calculate and report the salinity from the conductivity and the temperature. The reasons for this failure to calculate and report the salinity at the several meters involved are unknown. The reasons could be that the instrument was not set properly, the conductivity or temperature values measured were anomalous so that the CTD software could not handle them, or the meter suffered some other malfunction. These conductivity and temperature data are

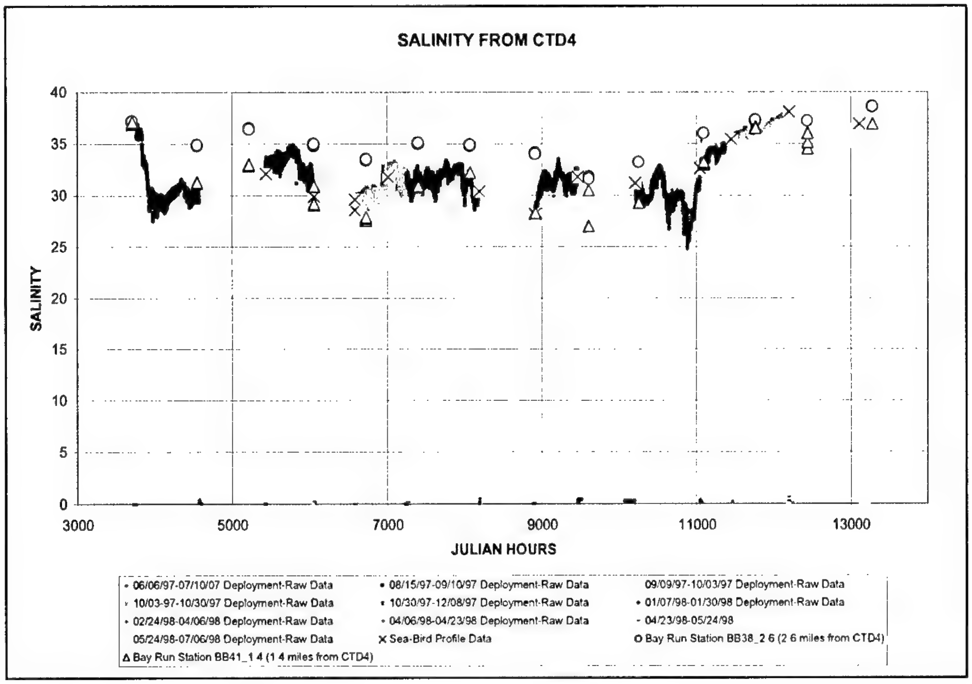


Figure 36. CTD4 salinity data, showing gaps in the data

part of the record and could be examined for salinity at a future time. Additionally, since specific conductance accounts for the bulk of the salinity signal, as expected, it could be examined in place of the salinity. The reasons for the missing salinity, however, are not known. In any case, however, the salinity data resulting from the BNP/CHL effort are voluminous even without the missing records.

Instrument movement

As noted in the section on water-surface elevations, the instrument deployed at the CTD11 site came loose and wandered about the Bay during two different deployments. Figure 22 shows CTD11 during its first trip around the Bay near the end of the 6 November 1997 deployment. The meter was recovered at the South Beach Jetty, and the salinity recorded during its journey, earlier described as representing a "spectacular failure," represents a curious record that is not possible to interpret. The second time the CTD11 device came loose, during the 10 December 1997 deployment, was the ill-fated deployment following the first deployment to come untied. No salinity data were recovered from this deployment.

The other instrument movement cases involved the loss of floatation at CTD3 and CTD5. Unless the water were highly stratified near the bottom of the Bay at the location such that a movement of 15 to 30 cm (6 to 12 in.) would make a difference in the already very near bottom readings, such movement is probably undetectable in the signal. A close examination shows no effect on the salinity when the meters at CTD3 or CTD5 fell to the bottom of the Bay from their

nominal deployed configuration. An instrument lying on the bottom could affect the fouling potential of its sensors, however.

Drift or biological fouling

Aside from catastrophic instrument failure, biological fouling of the sensors was the primary mechanism that caused unexpected changes to occur in the recorded salinity concentrations. By "unexpected change" is meant, for example, a mismatch between pre- and post-servicing salinity readings. This is the commonly observed phenomenon of biological growth in and around meter probes that depends, generally, on water temperature and salinity and which is most effectively combated by servicing the meters (cleaning the meter, inspecting the data, and taking appropriate action) at appropriate intervals, as discussed in Chapter 3. Biological growth on the conductivity sensors generally results in a change of the calibration of the sensors causing the salinity readings to either increase or decrease with time. Fouling may also influence the range of salinity values reported by the meter (e.g., the range over a tidal period). In any case, there were no corrections or adjustments made to the salinity data.

Most of the fouling that affects the data collection can be accounted for by two broad categories of biological growth. One is the growth of algae or other soft organisms, generally in a thin layer on and around the probes. The effects of this fouling are usually subtle and do not result in large sudden changes in salinity. The other category is the growth of hard organisms, primarily barnacles. The CTD's have orifices that contain pressure and conductivity probes. (The temperature probe is not usually a problem.) Salinity is calculated from the temperature and conductivity measurements. To measure the conductivity properly, water must be able to flow freely through the conductivity orifice and over the conductivity probe. Barnacles can (and do) grow rapidly in this narrow orifice channel, obstruct the flow of water, and influence the conductivity reading. Usually the conductivity reads low, and the result is a lowering of the calculated salinity value.

As seen in Figure 37 for CTD12, the change is progressive. This Figure 37 illustrates well the qualitative aspects of salinity drift. Data for all or part of five deployments are presented. The final deployment, for the period 18 May to 26 June 1998 (approximately Julian hours 12,000 to 13,000), shows a dramatic decrease in the salinity as measured by the CTD. At the beginning and end of the deployment a Sea-Bird profile was recorded, and during the deployment Bay Run data were gathered at three sites 0.7 and 1.0 mile from the CTD12 site. All of these data indicate that the dramatic drop in salinity readings is likely not due to the drop in salinity of the water. Since the meter was often found covered in barnacles, we conclude that biological fouling caused the drift in the data.

Earlier data sets in Figure 37 show what might be a smaller drift, particularly at the servicing periods near Julian hours 9500 and 11,500. Looking more closely at the former, in Figure 38, a definite mismatch between the two data sets can be seen. Both data sets are potentially consistent with the Sea-Bird data, and the data must be used with the knowledge that they do not match at the servicing time.

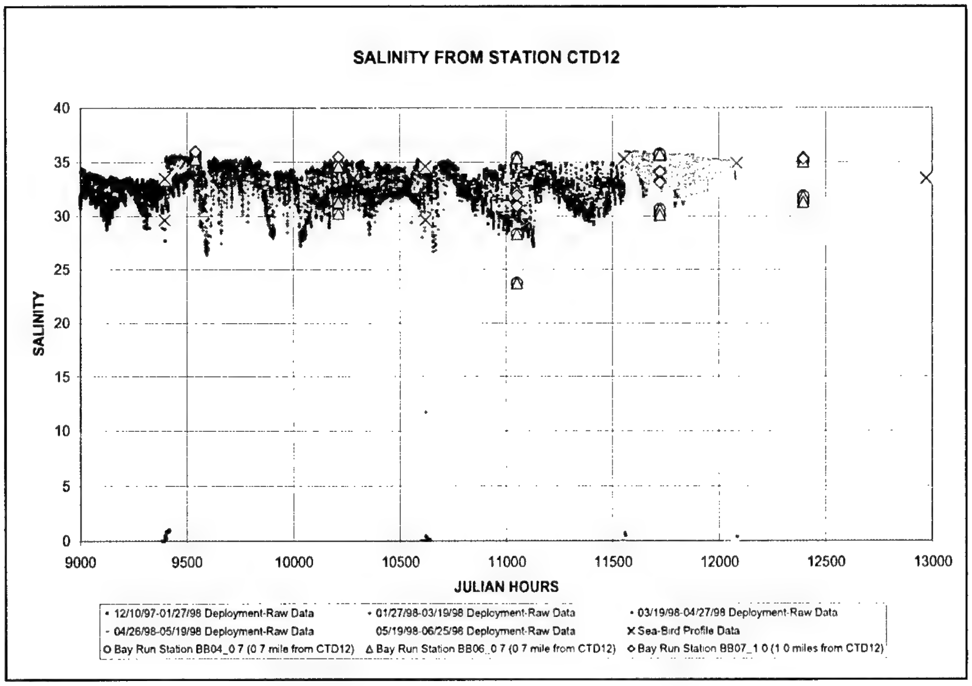


Figure 37. CTD12 salinity data showing the result of biological fouling

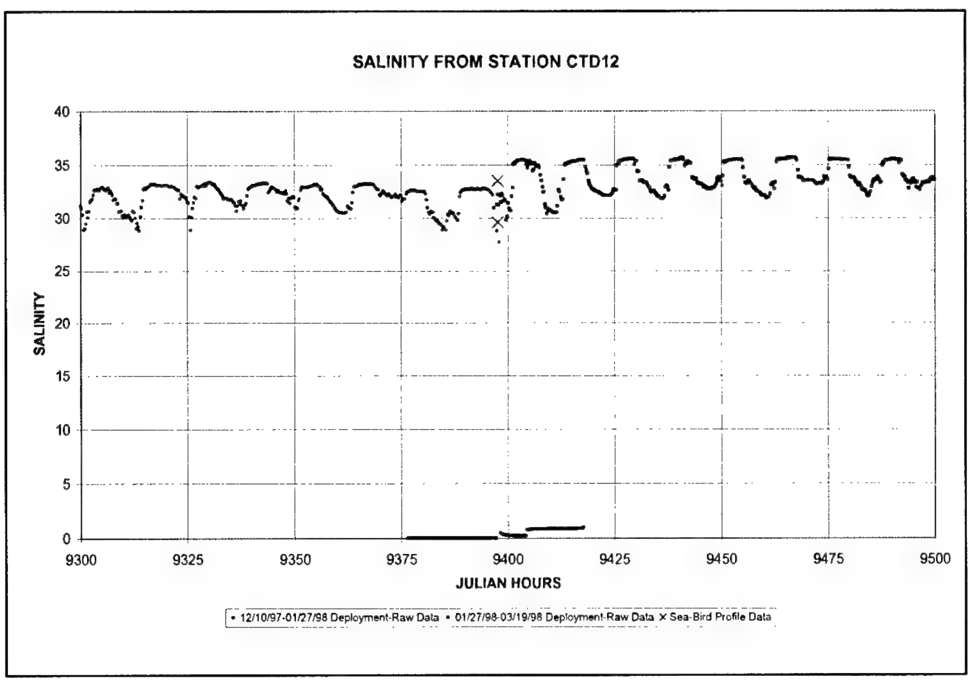


Figure 38. Close-up of CTD12 salinity data drift

CHL is reluctant to adjust for salinity drifts, especially when they are large, as in the 18 May 1998 CTD12 deployment, or nonlinear in character. Under some circumstances, however, the USGS provide correction, with documentation, to salinity data (Byrne and Patino 2001)[1]. Later each meter will be considered separately, as was done for the water-surface elevation data.

Though paints and coatings are available for use in preventing this growth, practice has indicated that probes must be inspected regularly to ensure proper meter operation. As discussed earlier, the meters and their data must be inspected often enough for the fouling, or other problems, to be detected and corrected, with the servicing interval adjusted according to the findings. The internal consistency checks afforded by servicing include, for example, checking to see if the last recorded values for a deployment period agree with the first recorded values of the replacement instrument (the "overlap" data of Tables 57 – 68). If these values are not close to one another, then biological fouling must be considered. Accounts from BNP regarding the condition of the retrieved meters and their orifices and probes are also useful in this determination.

Often what is seen is a progressive drift to lower salinities punctuated at the servicing by a sharp step back up to nominal values for the cleaned, re-deployed meter. This is shown in Figures 37 and 38, especially near hour 13,000 in Figures 37 and 39 where the jump to normal values is represented by the Sea-Bird data point. Thus, the first part of a meter's salinity record is generally the best part of its data, especially when biological fouling is a problem, with subsequent fouling progressively degrading the record. To determine the correctness of the

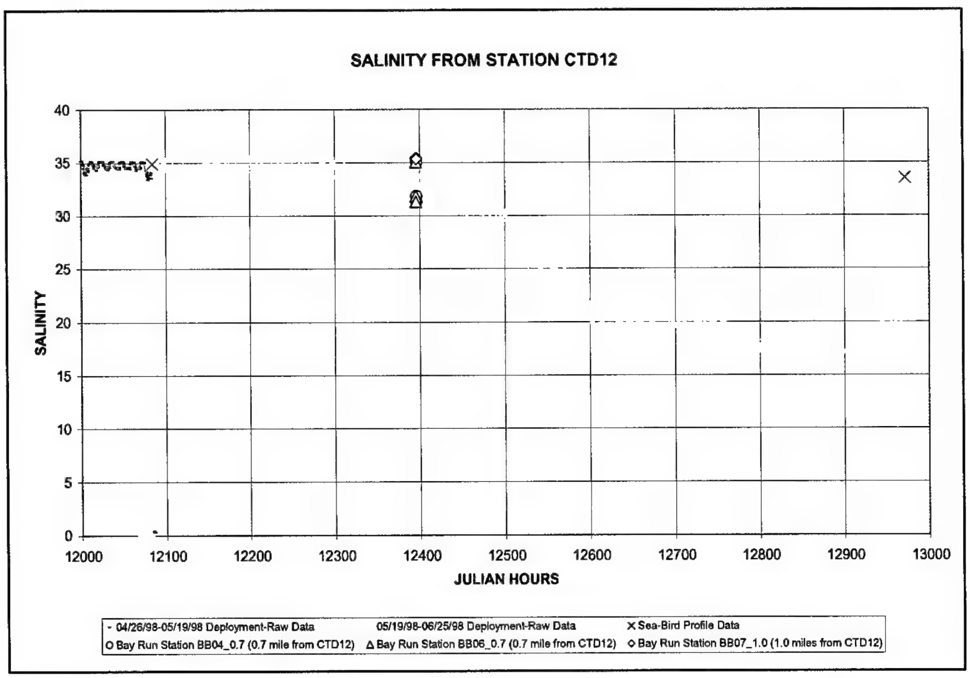


Figure 39. Close-up of CTD12 major salinity data drift

[1] Byrne, M., and Patino, E. (2001). USGS. Personal Communication.

initial reading of a CTD instrument, it was assumed that if the pre-deployment calibration salinity value matched that of the standard used, then presumably the initial salinity values returned by the sensor, upon deployment, were accurate. The calibration sheets prepared by BNP provide conductivity calibration data. These are summarized in Tables 69 – 80. Additionally, the Sea-Bird salinity profiles taken at the meter locations help in the assessment of the CTD salinities. No other measurements were noted. Thus, the combination of the profile, calibration, and overlapping data can be used as indicators of the degree of biological fouling and to provide other insight into the character of the data.

The presence of biological fouling or mismatches between laboratory standards and field data do not, however, render the data invalid for model development or other investigations. The data must be considered as a whole and useful aspects noted, extracted, and used as appropriate. For example, even biologically drifting data may reveal useful subtidal or tidal behaviors within the overall trend. And the response of the meters to cleaning lends confidence regarding the mechanisms at work to degrade the data. This confidence then allows consideration to be taken of these mechanisms as the data are examined. Field data are a representation of the prototype system, subject to faults, assumptions, and potential for improper interpretation just as any other representation of the real system, such as a numerical model. Thus, caution must be exercised and data used from an informed perspective. Despite our best guesses and experience, we do not know for certain the exact causes of the apparent data flaws. The salinity data as reviewed, however, appear similar in overall character to (good) data from other systems and are of sufficient quantity and quality for use in understanding the Biscayne Bay in general and for modeling in particular. Suggestions for future data collection efforts are presented in Appendix D.

Calibration

Calibration records for the CTD's, the overlap values for the deployed CTD's, and the Sea-Bird data provide an interesting data set for examining the quality of the salinity data. Tables 69 – 80 gather the calibration data for each instrument. The initial, pre-deployment calibration of the CTD salinity, in terms of specific conductivity, is very good. This is especially true after the first few deployments. The post-deployment specific conductivity and temperature check values were converted to salinity, and these salinity values were compared to one another and to the Sea-Bird and overlap salinities. The salinity calculations were conducted as described in Appendix E.

The quantities Δs, $\Delta s'$, $\Delta s''$, and $\Delta s'''$ in Tables 69 – 80 are differences between salinities for each meter deployment. Δs is the difference between the post-deployment salinity, S_p, and the salinity of the standard, S_s:

$$\Delta s = S_p - S_s$$

If Δs is less than zero, then the meter calibration drifted to lower salinities. Of 127 Δs's, 92 were negative. For larger salinity differences, the trend toward downward

values was more prominent. Of 57 drifts that were 0.3 in magnitude or larger, 49 were negative. For drifts that were larger in magnitude than 1.0, 11 of 13 were negative. The two positive values of these 13 were for deployments early in the effort when the calibration data are not as certain as later data and so may be suspect. Nevertheless, though it is possible for a CTD salinity to drift up, the overwhelming trend is for a downward drift characteristic of classic fouling.

The quantity $\Delta s'$ is the difference between the last good reading on the meter, S_L, and the first good reading on the new meter (an "overlap" value), S_F:

$$\Delta s' = S_L - S_F$$

If $\Delta s'$ is less than zero then, assuming the new meter is properly calibrated, the old meter can be said to have drifted to lower salinities. The trends in $\Delta s'$ are consistent with those of Δs but, more often than not the negative drifts of $\Delta s'$ are larger than those of Δs, especially for the larger drifts. This may mean that some of the drift has been lost in the movement from deployment to laboratory. Between Δs and $\Delta s'$ then, $\Delta s'$ may be the better indicator of drift.

The quantity $\Delta s''$ is the difference between the last CTD reading, S_L, and the Sea-Bird bottom reading, S_B:

$$\Delta s'' = S_L - S_B$$

If $\Delta s''$ is less than zero then the old meter has drifted to lower salinities with respect to the Sea-Bird data. The assumption is also made that the Sea-Bird value is taken at the same time and in the same place as the last reading on the old meter. The trends in $\Delta s''$ are, for the most part, consistent with those of $\Delta s'$ and Δs.

The quantity $\Delta s'''$ is the difference between the first reading on the new meter, S_F, and the Sea-Bird value S_B:

$$\Delta s''' = S_F - S_B$$

This is a very interesting quantity among the Δs-type quantities in that, if S_F and S_B were taken at the same place and at the same time, one would think they would be very close to one another in salinity. This assumes that the values are taken together (in time and space) and that the meters are similarly well calibrated and of similar "goodness" in measuring salinity *in situ*. For 15 values of $\Delta s'''$ that are larger in magnitude than 1.0, eight are positive and seven are negative, with similar magnitudes.

Though these Δs-type data provide interesting insight into the calibration and behavior of the CTD salinity instrument, uncertainties in the underlying numbers mean that the laboratory measures of calibration and drift may be the best measure of drift, followed closely by the overlap data for the deployed new and old CTD's. The overlap measures have the advantage of being *in situ*, and the laboratory measures have the advantages of a controlled environment and reproducible checking process.

There was a potential for 576 Δs quantities to be recorded for this field effort. Of these, the data available allowed calculation of 495. If the salinity difference 1.0 is used to sort these Δs's, then 414 are less than 1.0 and 81 are more than 1.0. This is a good record, indicating good data. The individual records, as given in Tables 69 – 80 can be examined for details that indicate which meters and which deployments were better or worse and, most importantly, how data collection can be improved in future efforts. For example, CTD12 had 16 of 37, out of a possible 48, Δs quantities greater than 1.0 in magnitude. This site encountered much barnacle growth, and it should be serviced more frequently in the future.

Drift index

A useful number that will help predict the order of magnitude of the time between servicing visits to salinity gauges can be derived from the analysis of salinity differences discussed above. This number, the drift index, is defined as

$$d_s = (\Delta s/S_s)/(T_{im})^2$$

Δs and S_s are as defined in the previous section, and T_{im} is the deployment time in days for the i^{th} CTD location during the m^{th} month (or deployment) of the year. For example, CTD12 was deployed from 19 March to 27 April 1998 for 39 days. During this time its calibration drifted by -3.30 and the salinity of the standard used for its post-calibration check was 36.17. The drift index for this case is thus

$$d_s = (-3.30/36.17)/(39 \text{ day})^2 = -6.0 \times 10^{-5}/\text{day}^2$$

to two significant figures. In this case, $\Delta s/S_s = -0.091$. If it were desired that the meter be serviced often enough during the March to April time frame so that a drift an order of magnitude smaller than -0.091 obtained, then the servicing time would be of the order

$$T^2 = (-0.0091/(-6.0 \times 10^{-5}) \text{ day}^2$$

or

$$T = 12 \text{ days}$$

rounded to the nearest day.

The 18 May to 26 June 1998 deployment of CTD12 resulted in a drift of -33.01, with a standard salinity value of 36.14 and a deployment time of 37 days. The drift index in this case is then

$$d_s = (-33.01/36.14)/(37 \text{ day})^2 = -6.7 \times 10^{-4}/\text{day}^2$$

which yields

$$T = 12 \text{ days}$$

for a one order of magnitude improvement and

T = 4 days

for a two order of magnitude improvement.

A closer look at the 18 May deployment at CTD12 (Figure 39) reveals that it appears to have equilibrated with respect to drift after about 25 days. Using 25 days instead of 37 for the time to calculate d_s gives more conservative servicing times of

T = 8 days

for a one order of magnitude improvement and

T = 2.5 days

for a two order of magnitude improvement.

The formulation used here assumes that the salinity trend line is concave downward with respect to time, and a simple parabolic form is assumed. Other forms, particularly a cubic form, might provide even better estimates. Methods based on logarithmic forms appear to give unrealistically short times for servicing intervals.

By building a database of drift indices (i.e., creating a set of "rules of thumb") for various locations and times of the year, estimates can be made for an initial servicing schedule that will concentrate effort on the potentially most sensitive sites during their most sensitive periods. Schedules can be adjusted as the actual field effort proceeds, and the database can be used to alert the crew to the special local and seasonal requirements of the various sites.

Conclusions

The salinity data discussed in this section are a large and useful set of salinity values and calibration data. The CTD instruments were well calibrated and the large majority of the individual deployment data sets do not show a drift significant enough to render them questionable. The post-deployment calibration data provide a useful data set for understanding fouling potential in various parts of the Bay, and they provide insight into the relationships between different methods of confirming that the meter is measuring what one thinks it is. These calibration data can also be used to derive quantitative measures and predictive tools, such as the drift index. These tools can help the novice especially but, also, remind the seasoned long-term salinity data collector to treat biological drift as a serious threat to the integrity of an expensive data collection and analysis effort.

CTD salinity details

More detail of the CTD salinity data and their collection are given in the following discussions. Information concerning the CTD's already contained in the earlier details section for the water surface section will not be repeated here.

CTD1: For the first six deployments temperatures were not recorded. Explicit calibration readings for conductivity were not recorded for the first two deployments. Fouling occurred near the end of the 12-17-97 to 02-17-98 deployment; instrument not running at recovery. No salinity data recorded for the 02-17-97 to 03-29-98 deployment. Power failure raised laboratory temperature for calibration for 06-01-98 to 07-09-98 deployment.

CTD2: Initial calibrations of conductivity similar to CTD1. Post-deployment standard was not apparent for 09-19-97 to 10-22-97 deployment. No salinity data recorded for 08-27-97 to 09-19-97 or 09-19-97 to 10-22-97 deployments. Failure of instrument occurred at the end of the 12-17-97 to 02-17-98 deployment. Power failure raised laboratory temperature for calibration for 06-01-98 to 07-09-98 deployment.

CTD3: Initial calibrations of conductivity similar to CTD1. Post-deployment standard was not apparent for 08-05-97 to 08-27-97 and 09-10-97 deployments. Log sheet missing for 08-05-97 to 08-27-97 deployment. No data were available for 01-24-98 to 02-18-98 period.

CTD4: Initial calibrations of conductivity similar to CTD1. Post-deployment standard was not apparent for 06-06-97 to 07-10-97 deployment. No salinity recorded for 07-10-97 to 07-29-97, 07-29-97 to 08-15-97, or 01-29-98 to 03-02-98 (temperature off 1˚C at deployment and at retrieval) deployments. No salinity recorded during 12-08-97 to 01-07-98 period (instrument failed immediately).

CTD5: Initial calibrations of conductivity similar to CTD1. Post-deployment standard was not apparent for 06-06-97 to 07-10-97 and 07-10-97 to 07-29-97 deployments. No post-deployment reading recorded for 06-06-97 to 07-10-97 deployments; six days of data only. No salinity data were available for 10-30-97 to 12-05-97 deployment. Data ended shortly before servicing for 02-20-98 to 04-01-98 deployment. Unit recovered on side on bottom with float missing for 05-24-98 to 07-1-98 deployment.

CTD6: Initial calibrations of conductivity similar to CTD1. No salinity data recorded for 10-30-97 to 12-05-97 deployment. Temperature was low for deployment and retrieval for 12-05-97 to 01-29-98 deployment.

CTD7: Initial calibrations of conductivity similar to CTD1. No salinity data recorded from 07-29-97 to 09-10-97. Unit for 08-15-97 to 09-10-97 deployment lost. Post-calibrations specific conductivity very high (20%) for 06-06-97 to 07-10-97 deployment. The 12-05-97 to 02-06-98 deployment failed near recovery time. Float bitten by turtle during 07-01-98 to 09-02-98 deployment.

CTD8: Initial calibrations of conductivity similar to CTD1. No salinity data recorded for 08-01-97 to 08-21-97 or 12-10-97 to 02-06-98 deployment. Failure occurred 04-21-98 to 05-10-98 before retrieval. AC was not working in laboratory for post-deployment check of 05-21-98 to 06-29-98 deployment.

CTD9: Initial calibrations of conductivity similar to CTD1. No log sheet available for 07-15-97 to 08-01-97 deployment. AC was not working in laboratory for post-deployment check for 05-21-98 to 06-29-98 deployment.

CTD10: Site first occupied 12-15-97. Fouling noted for 05-19-97 to 06-25-97 deployment.

CTD11: Initial calibrations of conductivity similar to CTD1. No salinity data recorded for 06-11-97 to 07-15-97 deployment. Data ended before retrieval for 07-15-97 to 08-01-97 deployment. Heavy fouling for 08-21-97 to 09-17-97 deployment.

CTD12: Initial calibrations of conductivity similar to CTD1. No log sheet for 08-01-97 to 08-21-97 deployment. No salinity data recorded for 08-21-97 to 09-17-97 deployment. Barnacles covered up conductivity orifice during 05-19-98 to 06-25-98 deployment.

Short-term BNP/CHL ADCP Velocity Data

The ADCP velocity data, as presented in Tables 28 and 29 and Plates 169-237, were inspected and also determined to be reasonable, accurate, and have sufficient quality and quantity for application in future uses. The return of the data from the ADCP velocity instruments was 100 %. No suspect data values were observed that would prevent any of the data being reported.

The approach used in this study was to perform data collection operations at an adequate number of appropriately distributed ADCP transects resulting in sufficient coverage of the study area and quantities of velocities and discharges. The reported data, therefore, consist of discharges through various inlets and other cross sections of the Bay for, typically, eight-hour surveys. The resulting intensive surveys from the two different time periods provide sufficient quantities of data for meaningful model development and verification.

5 Summary and Conclusions

Summary

The BNP/CHL data set is a very large and well-documented field data description of Biscayne Bay for the June 1997 to June 1998 period. The descriptions provided in this report are intended to guide the interested researcher into a use of the data proper. To assist in any further use, much of the quality control and calibration information is presented in more than one way. The salinity and water-surface elevation data received particularly detailed examinations. Furthermore, additional quantities were derived from these data, including averages of various data variables and new quantities such as the drift index, which can be helpful in planning and executing future field data collection exercises.

Large numbers of tables and plates help to illustrate and present the data, and five appendices describe the field methods, laboratory methods, salinity calculations, lessons learned and provide some analysis of the data. Finally, the raw data for the ADP, CTD, and weather station and spreadsheet data for ADP velocities and CTD water-surface elevations (raw depths and corrected to NGVD29 datum) and salinities are available from ERDC or SAJ.

Though these data are disseminated through this report to all with an interest, the purpose of the field data exercise was to provide a data set for the development of a 2D hydrodynamic and salinity model of Biscayne Bay. The following discussion centers on this purpose.

Weather Data

Weather data important to model development include wind speed and direction, barometric pressure, rainfall, and evaporation. The weather station was located over water on the submerged portion of the jetty near the BNP Headquarters. The rainfall data were incomplete due to a problem with the rain gauge. Data were missed from July to October 1997. Modelers may substitute for these missing data using data from other rain gauges in the area, such as the Miami Airport, or other such stations. The quality of the weather data is good, and the quantity is sufficient for model development.

ADP Velocity Data

Five ADP stations were occupied during the June 1997 to June 1998 period. These stations were distributed from the south in Card Sound, through the central Bay, and into North Bay near the Julia Tuttle Causeway. Three of the instruments performed well, while ADP1 and ADP4 had some problems. ADP4 was particularly troublesome in that its pressure sensor did not operate properly for most of the year.

The velocity data recorded were for four or more 30-cm bins, depending on the water depth, through the water column above the instrument. The portions of the data reported here are the near bottom, middepth, and near surface bin velocities. The malfunction of the ADP4 pressure sensor makes reporting the surface and middepth bins for it problematic. Despite the problems with ADP1 and, especially, ADP4, the data are of high quality and the quantity sufficient for development of a numerical model of hydrodynamics of Biscayne Bay.

CTD Data

Twelve CTD stations were occupied during the June 1997 to June 1998 period. These stations provided a very large data set of specific electrical conductivity values (corrected to 25 °C) and temperatures that are used to calculate salinity internal to the CTD. Pressure sensors provided a pressure head above the bottom-mounted instruments, enabling the calculation of water-surface elevation. These elevations could be related to the NGVD29 datum since the pressure sensors were surveyed in for eleven of the instruments.

Both the water-surface elevation and the salinity calibrations and multiple salinity checks, both *in situ* and in the laboratory, provided a wealth of information concerning the preparation and the behavior of the instruments while deployed. Information concerning lost and damaged meters also was provided. These pieces of information place the voluminous data in context and attest to its robustness. The information also provides valuable records that allow for better placement and servicing protocols to be developed for future field efforts.

The salinity and water surface data are of high quality and of sufficient quantity to be useful in model development for hydrodynamics and salinity. The water-surface elevation data are fixed to the NGVD29 datum. The fact that there are a number of known relations between MLLW and NGVD29 in the Bay system provides an opportunity to check the qualitative correctness of the water-surface elevations NGVD29 values. The comparison based on this more or less one year of data is good in most places where there are MLLW-NGVD29 relations to which comparisons can be made. The southernmost stations, particularly the Manatee Bay station CTD1, appear to be "perched" with respect to the other Bay stations. In light of the remoteness of the southern stations and the absence of any nearby MLLW-NGVD29 comparison points, it would be good to survey the deployment sites for CTD1, 2, and 3 again. Two stations in the

central Bay, CTD5 and 6, also appear anomalous. These two locations could also benefit from a resurvey.

ADCP Velocity Data

The ADCP transect data provided a large data set involving 27 transects measuring the discharge across Bay inlets and interior channels. These transects were traversed in October and in February to give information about discharges in both the wet and the dry seasons. The nine or so discharges for each transect taken during each season are given in Tables 28 and 29 and plotted in Plates 169-221. These discharges provide important information to modelers attempting to model the tidal prism of the Bay.

Conclusions

The BNP/CHL field data collection effort of June 1997 to June 1998 resulted in a significant contribution to the field knowledge of Biscayne Bay. The data taken, reduced, and analyzed are of sufficient quality and quantity, and they are sufficiently well documented, to allow use in model development or in other non-modeling activities in the study of Biscayne Bay. The effort also provided much insight into the practice of long-term continuous recording of data in the Bay System and provided many lessons learned for any such future effort in Biscayne Bay.

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Table 1
Locations of Equipment

Type of Equipment	Location	Coordinates		
		x^1	y^1	z^2
Acoustic Doppler Profiler	ADP-1 - Angel Fish Creek	737611	370946	No reference[3]
	ADP-2 - Center of Biscayne Bay	745006	418987	No reference
	ADP-3 - Safety Valve Marker 1A	766014	467099	No reference
	ADP-4 - Bear Cut Marker 1	770845	502707	No reference
	ADP-5 - Julia Tuttle Causeway Marker 35	771377	538707	No reference
Water Level Recorder	TG-1 - Manatee Bay	694563	328576	-3.90
	TG-2 - Card Sound Bridge	708516	347399	-4.33
	TG-3 - Angel Fish Creek	737640	364874	-4.76
	TG-4 - Military Canal - East	737982	422523	-6.43
	TG-5 - Military Canal - West	722433	423029	-2.12
	TG-6 - Black Point Marker 8	729419	434334	-3.57
	TG-7 - Snapper Creek	734188	462259	-5.51
	TG-8 - Gables by the Sea	743863	479467	-6.13
	TG-9 - Biscayne Channel Marker 10	776817	480830	-14.45
	TG-10 - Miami River	769227	522917	No reference
	TG-11 - Julia Tuttle Causeway Marker 35	771391	538679	-11.21
	TG-12 - Broad Causeway Marker 13	782751	566556	-5.45
Weather Station	WS-1 - Biscayne National Park	721039	411041	No reference

[1]Positions are NAD 27 State Plane Zone 0901, U. S. foot.
[2]Elevations are NGVD29, U. S. foot.
[3]The ADP's were not surveyed in for the vertical dimension. Depths of instrument deployment are given in Tables C1 and C2. Also, Tables 10 – 14 provide minimum and maximum head of water (depth) above the ADP's by month.

Table 2
ADCP Transect Location History Summary

Range	Location	Survey 1 (14-16 Oct 1997)			Survey 2 (26-28 Feb 1998)		
		Date	No. of Crossings	Hours est	Date	No. of Crossings	Hours est
1	Card Sound	10/14/97	9	0822-1550	2/28/98	9	0815-1554
2	Angelfish Creek	10/14/97	9	0816-1601	2/28/98	9	0806-1602
3	Broad Creek	10/14/97	9	0855-1623	2/28/98	9	0833-1623
4	Old Rhodes Key to Swan Key	10/14/97	9	0841-1612	2/28/98	9	0818-1614
5	Reid Key to Rubicon Keys	10/14/97	9	0844-1600	2/28/98	9	0816-1601
6	Caesar Creek from Christmas Point to Old Rhodes Key	10/14/97	9	0858-1615	2/28/98	9	0834-1611
7	Caesar Creek from Adams Key to Rubicon Keys	10/14/97	9	0922-1633	2/28/98	9	0822-1605
8	Biscayne Flats	10/15/97	9	0750-1555	2/27/98	6	1029-1538
10	Bear Cut	10/15/97	9	0829-1653	2/27/98	9	0902-1632
11	Rickenbacker Causeway	10/15/97	9	0914-1712	2/27/98	9	0837-1559
12	Norris Cut	10/15/97	7	1111-1659	2/26/98	6	0812-1258
112	Norris Cut	10/15/97	3	0846-1030	NA	NA	NA
13	Government Cut - Port Channel	10/15/97	10	0902-1715	2/26/98	6	0821-1312
14	Government Cut - Main Channel	10/15/97	10	0929-1723	2/26/98	6	0825-1316

(Continued)

NA = Not applicable for Survey 2

Table 2 (Concluded)

Range	Location	Survey 1 (14-16 Oct 1997)			Survey 2 (26-28 Feb 1998)		
		Date	No. of Crossings	Hours est	Date	No. of Crossings	Hours est
114	Government Cut - Main Channel	10/15/97	1	0910	NA	NA	NA
15	Coast Guard Channel	10/15/97	10	0934-1727	2/26/98	6	0827-1318
16	Meloy Channel	10/15/97	10	0916-1731	2/26/98	6	0829-1320
17	Miami River	10/16/97	10	0811-1659	2/27/98	9	0831-1631
18	Brickell Point Channel	10/16/97	10	0850-1704	2/27/98	9	0837-1636
19	Claughton Island to Bay Front Park	10/16/97	10	0820-1713	2/27/98	9	0849-1652
20	ICWW at Dodge Island Bridge	10/16/97	10	0830-1722	2/27/98	9	0902-1701
21	ICWW at 79th Street Causeway	10/16/97	11	0813-1733	2/26/98	9	0841-1610
121	79th Street Causeway Before North Bay Island	10/16/97	5	1111-1653	2/26/98	9	0851-1620
22	Channel Between North Bay Island and Treasure Island on 79th Street Causeway	10/16/97	10	0828-1706	2/26/98	9	0903-1633
23	Bascule Bridge	10/16/97	10	0838-1714	2/26/98	9	0910-1641
24	Normandy Isle to Biscayne Point	10/16/97	10	0853-1721	*	*	*
25	Indian Creek	10/16/97	10	0820-1658	2/26/98	8	0845-1528
26	Bakers Haulover Inlet	10/16/97	10	0826-1706	2/26/98	8	0853-1538
27	ICWW North of Bakers Haulover Inlet	10/16/97	10	0838-1716	2/26/98	8	0903-1553

* = Extremely low flow; no data taken for Survey 2

Table 3
Transect Coordinates, Intensive Survey 1, October 1997

Line No.	Coordinates[1]			
	Start		End	
	x	y	x	y
1	717523	360454	731400	354679
2	744927	364340	745279	364839
3	745192	370994	744678	370445
4	750086	370175	750453	370061
5	750588	386050	750470	386262
6	754365	385480	753365	383700
7	752043	387516	751362	387400
8	768792	484169	766123	467148
10	777058	506603	775892	508852
11	766796	513884	770149	514038
12	780872	517861	781484	518986
112	780641	517914	781484	518986
13	781133	520789	781243	521462
14	780790	522016	780983	522666
114	780790	522016	781761	522889
15	780983	522666	781098	522800
16	781761	522889	782428	523202
17	766720	522945	766678	522654
18	767102	521372	767761	521370
19	768170	523457	768296	522610
20	769177	525602	768554	526137
21	772149	551341	773085	551341
121	775632	551458	776071	551391
22	777240	552186	777768	552062
23	780663	551668	781341	552339
24	782185	556523	782254	555944
25	785259	568033	785924	568522
26	786563	569683	787231	571390
27	787409	572596	786068	573187

[1]Positions are NAD 27 State Plane Zone 0901, U. S. foot. Positions replicated using DGPS.

Table 4
Transect Coordinates, Intensive Survey 2, February 1998

Line No.	Coordinates[1]			
	Start		End	
	x	y	x	y
1	717523	360454	731400	354679
2	745015	364303	745263	364826
3	745200	370956	744688	370434
4	750135	370122	750420	370028
5	750556	386028	750445	386248
6	754360	385484	753420	383682
7	752014	387561	751365	387464
8	768864	491954	766245	476842
10	777070	506618	775890	508953
11	766697	513888	770131	514078
12	781406	519173	780871	517934
13	781133	520789	781243	521462
14	780790	522016	780983	522666
15	780983	522666	781098	522800
16	781754	523010	782378	523232
17	766790	522812	766813	522665
18	767102	521370	767746	521366
19	768186	523438	768303	522636
20	769134	525663	768538	526151
21	772122	551365	773177	551351
121	775618	551432	776089	551387
22	777223	552153	777710	552117
23	780794	551586	781468	552210
25	785259	568033	785924	568522
26	786563	569683	787231	571390
27	787409	572596	786068	573187

[1]Positions are NAD 27 State Plane Zone 0901, U. S. foot. Positions replicated using DGPS.

Table 5
CTD Servicing Schedule[1] and ADP Servicing Table

CTD Servicing Schedule												
Deployment Group	**Dates**											
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
1	06-06 07-08	06-13 07-08	06-06 07-02	06-06 07-10	06-06 07-10	06-06 07-10	06-06 07-10	06-12 07-15	06-12 07-15	x	06-11 07-15	06-18 07-15
2	07-08 07-18	07-08 07-18	07-02 07-18	07-10 07-29	07-10 07-29	07-10 07-29	07-10 07-29	x	x	x	x	x
3	07-18 08-05	07-18 08-05	07-18 08-05	x	x	x	x	07-15 08-01	07-15 08-01	x	07-15 08-01	07-15 08-01
4	08-05 08-27	08-05 08-27	08-05 08-27	07-29 08-15	07-29 08-15	07-29 08-15	07-29 08-15	08-01 08-21	08-01 08-21	x	08-01 08-21	08-01 08-21
5	08-27 09-19	08-27 09-19	08-27 09-19	08-15 09-10	08-15 09-10	08-15 09-10	08-15 09-10	08-31 09-17	08-21 09-17	x	08-21 09-17	08-21 09-17
6	09-19 10-22	09-19 10-22	09-19 10-22	09-10 10-03	09-10 10-03	09-10 10-03	09-10 10-08	09-17 10-08	09-17 10-09	x	09-17 10-20	19-17 10-20
7	x	x	X	10-03 10-30	10-03 10-30	10-03 10-30	10-08 10-30	10-08 11-06	10-09 11-06	x	x	X
8	10-22 11-19	10-22 11-19	10-22 11-19	x	x	x	x	x	x	x	10-20 11-06	10-20 11-06
9	x	x	X	10-30 12-08	10-30 12-05	10-30 12-05	10-30 12-05	11-06 12-10	11-06 12-10	x	11-06 12-10	11-06 12-10
10	11-19 12-17	11-19 12-17	11-19 12-17	x	x	x	x	x	x	x	x	x
11	x	x	X	12-08 01-07	12-05 01-29	12-05 01-29	12-05 02-06	12-10 02-06	12-10 01-30	12-15 01-27	12-10 01-27	12-10 01-27
12	12-17 02-17	12-17 02-17	12-17 02-18	x	x	x	x	x	x	x	x	x
13	x	x	x	01-07 01-30	x	x	x	x	x	x	x	x
14	x	x	x	01-30 03-02	01-29 02-20	01-29 03-26	02-06 03-26	02-06 03-26	01-30 03-30	01-27 03-19	01-27 03-20	01-27 03-19
15	02-17 04-01	02-17 04-01	02-18 03-27	03-02 04-06	02-20 04-01	x	x	x	x	x	x	x
16	04-01 05-04	04-01 05-04	03-27 04-23	04-06 04-23	04-01 04-29	03-26 04-29	03-26 04-29	03-26 04-21	03-30 04-21	03-19 04-21	03-19 04-27	03-19 04-27
17	x	x	04-23 05-05	04-23 05-24	04-29 05-24	04-29 05-24	04-29 05-21	04-21 05-21	04-21 05-21	04-21 05-19	04-27 05-19	04-27 05-19
18	05-04 06-01	05-04 06-01	05-05 06-01	x	x	x	x	x	x	x	x	x
19	06-01 07-09	06-01 07-09	06-01 07-09	05-24 07-01	05-24 07-01	05-24 07-01	05-21 07-10	05-21 06-29	05-21 06-29	05-19 06-25	05-19 06-25	05-19 06-25
20	x	x	x	x	x	x	x	x	x	x	06-25 08-04	X
ADP Servicing Table												
Deployment Group	**Dates**											
	1	**2**	**3**	**4**	**5**							
1	06-25 08-12	06-25 08-12	06-28 08-12	06-28 08-12	06-28 08-14							
2	08-14 11-08	08-12 11-04	08-12 11-04	09-11 11-04	08-14 11-04							
3	12-21 01-29	11-04 01-30	11-04 01-30	11-15 01-22	11-04 01-22							
4	01-29 03-18	01-30 03-18	01-30 03-18	01-22 03-25	01-22 03-25							
5	03-18 04-23	03-18 04-23	03-18 04-23	03-25 05-01	03-25 05-01							
6	04-23 07-23	04-23 05-15	04-23 08-04	05-15 08-04	05-01 08-04							

[1]Dates indicate nominal servicing schedule: data retrieval and CTD replacement. Some instruments may have failed or been lost when site visited.

Table 6
CTD Servicing Intervals in Days[1]

Deployment Group	Days											
	1	2	3	4	5	6	7	8	9	10	11	12
1	32	25	26	34	34	34	34	33	33	x	34	27
2	10	10	16	19	19	19	19	x	x	x	x	x
3	18	18	18	x	x	x	x	17	17	x	17	17
4	22	22	22	17	17	17	17	20	20	x	20	20
5	23	23	23	26	26	26	26	27	27	x	27	27
6	33	33	33	23	23	23	28	21	22	x	33	33
7	x	x	x	27	27	27	22	29	28	x	x	x
8	28	28	28	x	x	x	x	x	x	x	17	17
9	x	x	x	39	36	36	36	34	34	x	34	34
10	28	28	28	x	x	x	x	x	x	x	x	x
11	x	x	x	30	55	55	63	58	51	43	48	48
12	62	62	63	x	x	x	x	x	x	x	x	x
13	x	x	x	23	x	x	x	x	x	x	x	x
14	x	x	x	31	22	56	48	48	59	51	52	51
15	43	43	37	35	40	x	x	x	x	x	x	x
16	33	33	27	17	28	34	34	26	22	33	39	39
17	x	x	12	31	25	25	22	30	30	28	22	22
18	28	28	27	x	x	x	x	x	x	x	x	x
19	38	38	38	38	38	38	50	39	39	37	37	37
20	x	x	x	x	x	x	x	x	x	x	40	x

[1] Entries are rounded to nearest day. Compare with Table 5 for dates.

Table 7
Control Structures Discharges (cu ft) into Biscayne Bay[1] - June-December 1997

Location/Description	Latitude	Longitude	Sep	Oct	Nov	Dec
S197 Mouth Canal 111 - 3 miles from Manatee Bay and 750 ft east of U.S. Hwy 1	251712	802630	215,522,820	0	0	0
S20 On Levee 31E about 3 miles from Biscayne Bay shore	252200	802236	1,036,738,800	20,721,420	0	170,829,360
S20F Near mouth of Canal 103 at its junction with Levee 31E	252745	802052	1,263,558,330	479,562,570	334,426,590	707,973,210
S20G Near mouth of Military Canal at its junction with Levee 31E	252920	802051	130,443,030	9,314,730	18,180	22,200,660
S21A Near mouth of Canal 102 at its junction with Levee 31E	253108	802047	603,343,440	249,238,710	178,138,800	356,121,720
S21 Near mouth of Canal 1 at its junction with Levee 31E	253234	801952	1,187,361,360	445,587,660	63,030,240	640,945,260
S123 Near mouth of Canal C-100 below the junction of C-100, C-100A, and C-100B	253636	801829	319,072,680	0	4,320	26,559,720

(Continued)

[1]Time sequences of discharges, as calculated from DBHYDRO, were provided by SFWMD. Integrations for monthly volumes (discharges) performed at CHL.

Table 7 (Concluded)

Location/Description	Latitude	Longitude	Sep	Oct	Nov	Dec
S22 Near mouth of Canal 2 about 7,000 ft from Biscayne Bay shore	254011	801703	1,274,187,330	904,621,770	18,435,420	743,102,280
G93 Coral Gables Control Structure	254417	801713	46,350,540	163,282,500	159,155,460	195,803,010
S25B In Miami, downstream Le Jeune Road crossing Tamiami Canal, C-4	254737	801546	1,253,471,850	753,612,660	631,000,170	1,118,305,080
S25 In Miami NE 27th Avenue crossing of C-5 Comfort Canal	254751	801445	78,980,130	65,092,320	53,653,950	70,379,550
S26 In Miami NW 36th Street crossing Miami Canal, C-6	254828	801540	623,334,060	855,173,610	495,040,140	793,487,700
S27 In Miami, mouth Canal 7 - 700 ft from Biscayne Bay shore	255054	801121	809,374,410	513,472,050	397,816,020	677,581,290
S28 In Miami, mouth Canal 8 - 1 mile from Biscayne Bay shore	255214	801043	615,309,030	238,868,550	23,228,100	213,787,440
G58 Arch Creek downstream from Florida Coast railroad bridge	255359	800944	17,034,210	1,906,110	373,860	157,500
S29 In North Miami Beach, mouth Canal 9 (Snake Creek Canal) - 500 ft shore Lake Maule	255541	800904	1,750,153,320	751,657,410	295,299,450	1,280,648,610

Table 8
Control Structures Discharges (cu ft) into Biscayne Bay - January-June 1998[1]

Location/Description	Latitude	Longitude	Jan	Feb	Mar	Apr	May	Jun
S197 Mouth Canal 111 - 3 miles from Manatee Bay and 750 ft east of U.S. Hwy 1	251712	802630	0	0	0	0	0	0
S20 On Levee 31E about 3 miles from Biscayne Bay shore	252200	802236	0	42,483,060	0	0	0	0
S20F Near mouth of Canal 103 at its junction with Levee 31E	252745	802052	497,124,540	835,716,600	649,972,440	112,051,800	50,800,320	54,676,260
S20G Near mouth of Military Canal at its junction with Levee 31E	252920	802051	2,952,360	43,684,200	31,698,000	58,860	22,754,880	11,203,920
S21A Near mouth of Canal 102 at its junction with Levee 31E	253108	802047	181,069,920	286,256,160	348,692,760	113,789,340	19,104,390	23,824,170
S21 Near mouth of Canal 1 at its junction with Levee 31E	253234	801952	557,073,900	851,803,200	896,781,510	347,030,190	204,874,110	57,766,050
S123 Near mouth of Canal C-100 below the junction of C-100, C-100A, and C-100B	253636	801829	34,384,860	438,457,860	119,986,380	6,226,020	0	501,300
S22 Near mouth of Canal 2 about 7,000 ft from Biscayne Bay shore	254011	801703	483,686,550	896,441,490	982,202,490	18,644,310	0	4,643,640
G93 Coral Gables Control Structure	254417	801713	149,839,290	173,339,010	181,016,370	132,717,960	159,633,810	147,329,280
S25B In Miami, downstream Le Jeune Road crossing Tamiami Canal, C-4	254737	801546	749,449,260	626,429,610	942,900,120	247,482,810	453,390,030	274,451,400

(Continued)

[1]Time sequences of discharges, as calculated from DBHYDRO, were provided by SFWMD. Integrations for monthly volumes (discharges) performed at CHL.

Table 8 (Concluded)

Location/Description	Latitude	Longitude	Jan	Feb	Mar	Apr	May	Jun
S25 In Miami NE 27th Avenue crossing of C-5 Comfort Canal	254751	801445	58,183,830	84,749,850	96,918,660	48,160,080	55,397,880	52,553,160
S26 In Miami NW 36th Street crossing Miami Canal, C-6	254828	801540	533,029,050	473,097,060	1,389,274,560	1,105,185,420	673,437,420	178,418,700
S27 In Miami, mouth Canal 7 - 700 ft from Biscayne Bay shore	255054	801121	525,534,390	605,478,600	693,357,300	111,707,190	455,785,330	470,352,600
S28 In Miami, mouth Canal 8 - 1 mile from Biscayne Bay shore	255214	801043	125,205,500	479,938,140	309,764,160	16,501,500	91,321,470	61,471,890
G58 Arch Creek downstream from Florida Coast railroad bridge	255359	800944	0	2,686,320	1,615,140	0	1,178,010	1,512,630
S29 In North Miami Beach, mouth Canal 9 (Snake Creek Canal) - 500 ft shore Lake Maule	255541	800904	918,744,660	1,442,033,640	1,524,597,030	357,770,070	350,749,350	56,287,170

Table 9
Biscayne Bay, Station 1, Weather Data Summary

Time Period	Data Range	Wind Speed m/sec	Resultant Wind Direction[1] deg	Air Temperature °C	Relative Humidity %	Rainfall mm	Barometric Pressure mm of Hg	Solar Radiation Flux[2] W/m²	Solar Radiation[2] kJ/m²
1997									
7/17-7/31	Maximum	9.42	122.15	32.83	99	*	766	1166	1050
	Minimum	0.2		24.65	60.82		761	438	393
	Average of Maximum and Minimum	4.81		28.74	79.91		763.5	802	722
8/1-8/31	Maximum	13.23	114.31	33.14	100	*	766	1206	1085
	Minimum	0.13		23.31	59.82		759	763	684
	Average of Maximum and Minimum	6.68		28.23	79.91		762.5	985	885
9/1-9/30	Maximum	11.2	102.69	32.53	100	*	764	1025	922
	Minimum	0.134		24.77	61.77		757	227	205
	Average of Maximum and Minimum	5.667		28.65	80.89		760.5	626	564
10/1-10/31	Maximum	11.29	71.70	30.12	100	29.72	766	1041	937
	Minimum	0.071		17.36	47.84		758	591	532
	Average of Maximum and Minimum	5.681		23.74	73.92		762	816	735
11/1-11/30	Maximum	10.90	50.08	**	100	78.99	768	828	745
	Minimum	0.07		**	50.37		755	292	262

(Sheet 1 of 3)

*Data not available; equipment malfunction, 7/17-10/17/97.
**Data not available; equipment malfunction on 10/27/97-3/31/98. Last good temperature on 10/27/97 at 1145 hours.
[1]Calculated using all appropriate data for the time period.
[2]Maximum (minimum) values are the largest (smallest) of the daily maxima during the time period.

Table 9 (Continued)

Time Period	Data Range	Wind Speed m/sec	Resultant Wind Direction deg	Air Temperature °C	Relative Humidity %	Rainfall mm	Barometric Pressure mm of Hg	Solar Radiation Flux W/m	Solar Radiation kJ/m
11/1-11/30 (Cont)	Average of Maximum and Minimum	5.485		**	75.19		761.5	560	504
12/1-12/31	Maximum	11.76	278.52	**	100	168.66	772	859	773
	Minimum	0.087		**	32.47		754	93	84
	Average of Maximum and Minimum	5.924		**	66.24		763	476	429
1998									
1/1-1/31	Maximum	10.98	84.95	**	100	42.93	773	845	761
	Minimum	0.042		**	35.99		757	219	198
	Average of Maximum and Minimum	5.51		**	68.00		765	532	480
2/1-2/28	Maximum	18.06	152.25	**	100	160.28	767	930	837
	Minimum	0.046		**	0.133		750	314	283
	Average of Maximum and Minimum	9.05		**	50.07		758.5	622	560
3/1-3/31	Maximum	11.95	76.98	**	100	99.32	771	998	898
	Minimum	0.106		**	0.066		755	597	537
	Average of Maximum and Minimum	6.03		**	50.03		763	798	718
4/1-4/30	Maximum	10.0	125.77	30.12	100	3.56	767	1053	947
	Minimum	0.141		15.96	0.133		756	847	763
	Average of Maximum and Minimum	5.07		23.04	50.07		761.5	950	855

(Sheet 2 of 3)

Table 9 (Concluded)

Time Period	Data Range	Wind Speed m/sec	Resultant Wind Direction deg	Air Temperature °C	Relative Humidity %	Rainfall mm	Barometric Pressure mm of Hg	Solar Radiation Flux W/m	Solar Radiation kJ/m
5/1-5/31	Maximum	13.99	135.32	32.92	100	114.06	765	1201	1081
	Minimum	0.055		20.02	0.066		755	489	438
	Average of Maximum and Minimum	7.02		26.47	50.03		760	845	760
6/1-6/30	Maximum	13.49	136.27	34.27	100	34.80	766	1101	990
	Minimum	0.129		23.88	0.133		758	952	853
	Average of Maximum and Minimum	6.81		29.08	50.07		762	1027	922
7/1-7/31	Maximum	8.58	99.87	32.60	100	29.21	766	1103	993
	Minimum	0.147		25.27	58.32		760	903	813
	Average of Maximum and Minimum	4.36		28.94	79.16		763	1003	903

(Sheet 3 of 3)

Table 10
Biscayne Bay, Station 1 (ADP1), Acoustic Doppler Profiler Data Summary[1]

Time Period	Depth	Flow Direction[2]	Velocity[3] Direction Minimum deg	Velocity[3] Direction Maximum deg	Velocity[3] Magnitude Minimum cm/sec	Velocity[3] Magnitude Maximum cm/sec	Head of Water Above Instrument[4] Minimum m	Head of Water Above Instrument[4] Maximum m	Temperature[5] Minimum °C	Temperature[5] Maximum °C
1997										
12/21-12/31	Near Surface	Ebb	315.0	283.4	0.4	75.3	1.7	2.2	18.4	24.8
		Flood	180.0	276.6	0.1	57.5				
	Middepth	Ebb	346.0	268.8	1.2	41.7				
		Flood	90.0	10.9	0.6	41.2				
	Near Bottom	Ebb	301.0	8.1	0.6	26.4				
		Flood	309.8	285.7	0.8	26.3				
1998										
1/1-1/31	Near Surface	Ebb	78.7	282.3	0.5	65.5	1.8	2.3	17.2	24.9
		Flood	333.4	280.7	0.4	59.9				
	Middepth	Ebb	225.0	262.6	0.1	51.5				
		Flood	270.0	257.9	0.7	47.2				
	Near Bottom	Ebb	270.0	6.8	0.1	27.2				
		Flood	0	280.7	0	22.2				

(Sheet 1 of 4)

[1]Quantities are for available data during the time period indicated.
[2]Ebb and flood determination is discussed in text.
[3]Minimum (maximum) velocity direction in each row is for the minimum (maximum) velocity magnitude in that row. North is 0°, increasing clockwise. Direction indicates direction to which current moves.
[4]Pressure head above instrument (uncorrected) only.
[5]Temperatures are all near bottom.

Table 10 (Continued)

			Velocity				Head of Water Above Instrument		Temperature	
			Direction		Magnitude					
Time Period	Depth	Flow Direction	Minimum deg	Maximum deg	Minimum cm/sec	Maximum cm/sec	Minimum m	Maximum m	Minimum °C	Maximum °C
2/1-2/28	Near Surface	Ebb	26.6	73.8	0.2	39.4	1.7	2.3	16.6	25.4
		Flood	194.0	301.9	0.4	37.3				
	Middepth	Ebb	0	70.9	0.1	66.5				
		Flood	270.0	299.4	0.6	60.6				
	Near Bottom	Ebb	315.0	303.6	0.3	28.6				
		Flood	315.0	315.0	0.3	28.1				
3/1-3/31	Near Surface	Ebb	231.3	77.1	0.6	44.8	1.7	2.4	16.9	25.7
		Flood	180.0	194.0	0.1	42.7				
	Middepth	Ebb	80.5	308.6	0.6	53.4				
		Flood	270.0	298.9	1.2	51.7				
	Near Bottom	Ebb	0	297.2	0	27.6				
		Flood	51.3	291.4	0.6	33.1				

(Sheet 2 of 4)

Table 10 (Continued)

Time Period	Depth	Flow Direction	Velocity				Head of Water Above Instrument		Temperature	
			Direction		Magnitude					
			Minimum deg	Maximum deg	Minimum cm/sec	Maximum cm/sec	Minimum m	Maximum m	Minimum °C	Maximum °C
4/1-4/30	Near Surface	Ebb	26.6	210.4	0.9	45.1	1.7	2.3	20.7	27.6
		Flood	135.0	226.1	0.1	46.3				
	Middepth	Ebb	315.0	285.4	0.4	49.3				
		Flood	221.6	281.5	1.2	51.7				
	Near Bottom	Ebb	77.0	40.9	1.3	32.4				
		Flood	270.0	256.6	0.4	23.7				
5/1-5/31	Near Surface	Ebb	45.0	217.9	0.3	45.1	1.7	2.3	25.9	30.1
		Flood	180.0	211.6	0.1	44.6				
	Middepth	Ebb	153.4	61.2	0.4	57.5				
		Flood	0	59.7	0	49.5				
	Near Bottom	Ebb	344.1	49.2	0.7	34.0				
		Flood	116.6	49.7	0.2	28.3				
6/1-6/30	Near Surface	Ebb	251.6	223.8	0.3	33.7	1.8	2.3	28.7	33.2
		Flood	213.7	224.4	0.4	38.5				
	Middepth	Ebb	14.0	291.4	0.4	45.0				
		Flood	29.7	287.7	0.8	53.5				
	Near Bottom	Ebb	80.5	38.4	0.6	32.0				
		Flood	198.4	39.7	0.3	26.0				

(Sheet 3 of 4)

Table 10 (Concluded)

Time Period	Depth	Flow Direction	Velocity				Head of Water Above Instrument		Temperature	
			Direction		Magnitude					
			Minimum deg	Maximum deg	Minimum cm/sec	Maximum cm/sec	Minimum m	Maximum m	Minimum °C	Maximum °C
7/1-7/31	Near Surface	Ebb	296.6	196.8	0.2	33.5	1.8	2.2	30.6	33.3
		Flood	90.0	224.2	0.5	39.2				
	Middepth	Ebb	309.3	281.9	1.4	41.6				
		Flood	146.3	280.5	0.4	41.3				
	Near Bottom	Ebb	216.9	43.9	1.0	30.3				
		Flood	251.6	289.4	0.6	23.8				

(Sheet 4 of 4)

Table 11
Biscayne Bay, Station 2 (ADP2), Acoustic Doppler Profiler Data Summary[1]

			Velocity[3]				Head of Water[4] Above Instrument		Temperature[5]	
			Direction		Magnitude					
Time Period	Depth	Flow Direction[2]	Minimum deg	Maximum deg	Minimum cm/sec	Maximum cm/sec	Minimum m	Maximum m	Minimum °C	Maximum °C
1997										
6/27-6/30	Near Surface	Ebb	161.6	104.7	0.3	20.5	1.8	2.4	30.0	32.6
		Flood	90.0	119.0	0.2	20.8				
	Middepth	Ebb	348.7	353.1	1.0	25.1				
		Flood	230.2	281.6	1.6	36.2				
	Near Bottom	Ebb	177.7	347.7	2.5	27.2				
		Flood	230.2	259.5	0.8	26.9				
7/1-7/31	Near Surface	Ebb	0	37.4	0.2	32.7	1.8	2.5	29.5	32.6
		Flood	180.0	80.2	0.1	34.0				
	Middepth	Ebb	0	21.2	0.3	60.2				
		Flood	90.0	182.7	0.6	44.8				
	Near Bottom	Ebb	90.0	13.4	0.4	46.5				
		Flood	270.0	193.5	0.4	37.7				
8/1-8/31	Near Surface	Ebb	0	222.7	0	36.6	1.8	2.6	28.5	33.1
		Flood	270.0	118.5	0.1	29.9				
	Middepth	Ebb	321.3	110.0	0.6	53.6				
		Flood	270.0	179.7	0.1	50.7				
	Near Bottom	Ebb	180.0	340.2	0.7	43.1				

(Sheet 1 of 4)

[1]Quantities are for available data during the time period indicated.
[2]Ebb and flood determination is discussed in text.
[3]Minimum (maximum) velocity in each row is for the minimum (maximum) velocity magnitude in that row. North is 0°, increasing clockwise. Direction indicates direction to which current moves.
[4]Pressure head above instrument (uncorrected) only.
[5]Temperatures are all near bottom

Table 11 (Continued)

Time Period	Depth	Flow Direction	Velocity: Direction Minimum deg	Velocity: Direction Maximum deg	Velocity: Magnitude Minimum cm/sec	Velocity: Magnitude Maximum cm/sec	Head of Water Above Instrument Minimum m	Head of Water Above Instrument Maximum m	Temperature Minimum °C	Temperature Maximum °C
8/1-8/31 (Cont)	Near Bottom (Cont)	Flood	135.0	179.7	0.1	43.0				
9/1-9/30	Near Surface	Ebb	180.0	242.5	0.1	33.9	1.8	2.7	26.8	30.2
		Flood	0	9.6	0	40.4				
	Middepth	Ebb	37.9	11.0	1.1	46.9				
		Flood	0	196.1	1.0	41.5				
	Near Bottom	Ebb	119.7	6.2	0.8	41.5				
		Flood	116.6	199.8	0.2	39.0				
10/1-10/31	Near Surface	Ebb	225.0	356.0	0.1	28.8	1.9	2.8	23.9	29.2
		Flood	0	342.5	0	34.6				
	Middepth	Ebb	236.3	59.0	0.7	41.0				
		Flood	303.7	164.7	0.4	40.5				
	Near Bottom	Ebb	270.0	54.9	0.2	32.4				
		Flood	180.0	171.7	0.1	37.4				
11/1-11/30	Near Surface	Ebb	0	270.0	0	33.1	1.8	2.7	21.8	27.2
		Flood	270.0	173.5	0.1	27.4				
	Middepth	Ebb	38.7	38.6	0.6	43.5				
		Flood	191.3	231.4	0.5	43.8				
	Near Bottom	Ebb	251.6	42.2	0.3	42.8				

(Sheet 2 of 4)

Table 11 (Continued)

Time Period	Depth	Flow Direction	Velocity				Head of Water Above Instrument		Temperature	
			Direction		Magnitude					
			Minimum deg	Maximum deg	Minimum cm/sec	Maximum cm/sec	Minimum m	Maximum m	Minimum °C	Maximum °C
11/1-11/30 (Cont)	Near Bottom (Cont)	Flood	192.5	232.1	0.9	33.1				
12/1-12/31	Near Surface	Ebb	0	223.2	0	35.1	1.8	2.7	17.2	24.6
		Flood	0	9.2	0	33.2				
	Middepth	Ebb	191.3	34.5	0.5	51.0				
		Flood	90.0	159.5	0.2	37.9				
	Near Bottom	Ebb	153.4	45.5	0.2	47.9				
		Flood	108.4	195.1	0.3	43.0				
1998										
1/1-1/31	Near Surface	Ebb	270.0	68.8	0.1	30.7	1.9	2.7	17.4	24.8
		Flood	333.4	144.5	0.2	22.7				
	Middepth	Ebb	0	40.8	0.5	50.7				
		Flood	85.9	24.5	1.4	44.2				
	Near Bottom	Ebb	180.0	43.9	0.3	41.9				
		Flood	111.8	181.5	0.5	38.9				
2/1-2/28	Near Surface	Ebb	0	188.0	0	33.1	1.8	2.8	16.3	25.3
		Flood	0	71.3	0	24.0				
	Middepth	Ebb	20.6	72.3	0.9	49.7				
		Flood	153.4	204.6	0.2	41.5				

(Sheet 3 of 4)

Table 11 (Concluded)

Time Period	Depth	Flow Direction	Velocity				Head of Water Above Instrument		Temperature	
			Direction		Magnitude					
			Minimum deg	Maximum deg	Minimum cm/sec	Maximum cm/sec	Minimum m	Maximum m	Minimum °C	Maximum °C
2/1-2/28 (Cont)	Near Bottom	Ebb	180.0	25.9	0.3	40.7				
		Flood	45.0	193.2	0.1	34.6				
3/1-3/31	Near Surface	Ebb	0	125.3	0	22.3	1.8	2.8	17.7	25.9
		Flood	108.4	182.1	0.3	27.8				
	Middepth	Ebb	180.0	34.1	0.5	52.6				
		Flood	270.0	210.9	0.2	56.4				
	Near Bottom	Ebb	90.0	41.3	1.1	44.4				
		Flood	135.0	184.9	0.8	42.2				
4/1-4/30	Near Surface	Ebb	26.6	210.4	0.9	45.1	1.7	2.3	20.7	27.6
		Flood	135.0	226.1	0.1	46.3				
	Middepth	Ebb	315.0	285.4	0.4	49.3				
		Flood	221.6	281.5	1.2	51.7				
	Near Bottom	Ebb	77.0	40.9	1.3	32.4				
		Flood	270.0	256.6	0.4	23.7				
5/1-5/31	Near Surface	Ebb	45.0	217.9	0.3	45.1	1.7	2.3	25.9	30.1
		Flood	180.0	211.6	0.1	44.6				
	Middepth	Ebb	153.4	61.2	0.4	57.5				
		Flood	0	59.7	0	49.5				
	Near Bottom	Ebb	333.4	7.8	0.2	33.3				
		Flood	90.0	246.1	0.4	34.3				

(Sheet 4 of 4)

Table 12
Biscayne Bay, Station 3 (ADP3), Acoustic Doppler Profiler Data Summary[1]

			Velocity[3]				Head of Water Above Instrument[4]		Temperature[5]	
			Direction		Magnitude					
Time Period	Depth	Flow Direction[2]	Minimum deg	Maximum deg	Minimum cm/sec	Maximum cm/sec	Minimum m	Maximum m	Minimum °C	Maximum °C
1997										
6/26-6/30	Near Surface	Ebb	103.7	52.2	4.2	28.9	2.6	3.2	29.6	31.9
		Flood	260.5	255.1	1.2	33.4				
	Middepth	Ebb	302.0	320.8	0.9	39.6				
		Flood	170.2	270.1	5.3	60.6				
	Near Bottom	Ebb	115.6	57.2	5.5	25.7				
		Flood	105.9	257.7	0.7	27.1				
7/1-7/31	Near Surface	Ebb	0	22.6	0.4	45.0	2.6	3.4	29.5	32.3
		Flood	0	261.0	0.2	40.1				
	Middepth	Ebb	276.3	27.6	1.8	66.4				
		Flood	180.0	260.8	1.4	63.1				
	Near Bottom	Ebb	180.0	29.8	0.2	81.6				
		Flood	218.7	1.7	1.3	30.4				
8/1-8/31	Near Surface	Ebb	101.3	179.3	0.5	40.8	2.7	3.6	28.7	32.6
		Flood	0	261.0	0	37.7				
	Middepth	Ebb	90.0	75.2	0.3	62.0				
		Flood	323.1	263.2	0.5	59.7				
	Near Bottom	Ebb	251.6	29.2	0.6	97.4				

(Sheet 1 of 5)

[1] Quantities are for available data during the time period indicated.
[2] Ebb and flood determination is discussed in text.
[3] Minimum (maximum) velocity direction in each row is for the minimum (maximum) velocity magnitude in that row. North is 0° increasing clockwise. Direction indicates direction to which current moves.
[4] Pressure head above instrument (uncorrected) only.
[5] Temperatures are all near bottom.

Table 12 (Continued)

Time Period	Depth	Flow Direction	Velocity				Head of Water Above Instrument		Temperature	
			Direction		Magnitude					
			Minimum deg	Maximum deg	Minimum cm/sec	Maximum cm/sec	Minimum m	Maximum m	Minimum °C	Maximum °C
8/1-8/31 (Cont)	Near Bottom (Cont)	Flood	323.1	15.3	0.5	73.0				
9/1-9/30	Near Surface	Ebb	90.0	36.0	0.2	45.2	2.6	3.6	26.7	29.9
		Flood	90.0	216.5	0.1	42.3				
	Middepth	Ebb	90.0	72.2	0.3	54.6				
		Flood	212.0	239.7	0.9	57.5				
	Near Bottom	Ebb	324.5	40.9	0.9	53.7				
		Flood	153.4	38.0	0.2	41.0				
10/1-10/31	Near Surface	Ebb	90.0	114.3	0.1	36.4	2.7	3.7	23.6	28.6
		Flood	0	291.3	0	56.9				
	Middepth	Ebb	45.0	86.6	0.3	54.1				
		Flood	0	246.5	0.3	62.5				
	Near Bottom	Ebb	0	268.8	0.3	90.5				
		Flood	213.7	271.3	0.7	103.7				
11/1-11/30	Near Surface	Ebb	180.0	59.2	0.6	46.5	2.6	3.6	21.9	26.6
		Flood	90.0	264.1	0.2	39.6				
	Middepth	Ebb	90.0	49.5	0.5	60.8				
		Flood	195.9	259.6	0.7	63.9				
	Near Bottom	Ebb	248.2	38.9	0.5	68.3				

Sheet 2 of 5)

Table 12 (Continued)

Time Period	Depth	Flow Direction	Velocity				Head of Water Above Instrument		Temperature	
			Direction		Magnitude					
			Minimum deg	Maximum deg	Minimum cm/sec	Maximum cm/sec	Minimum m	Maximum m	Minimum °C	Maximum °C
11/1-11/30 (Cont)	Near Bottom (Cont)	Flood	135.0	269.5	0.8	54.7				
12/1-12/31	Near Surface	Ebb	0	99.2	0	49.2	2.6	3.6	17.4	23.9
		Flood	216.9	104.8	0.5	44.5				
	Middepth	Ebb	135.0	96.8	0.3	53.9				
		Flood	270.0	265.8	0.1	55.6				
	Near Bottom	Ebb	216.9	74.5	0.5	32.9				
		Flood	180.0	312.7	0.5	58.7				
1998										
1/1-1/31	Near Surface	Ebb	326.3	37.2	0.4	41.2	2.7	3.7	17.4	24.7
		Flood	71.6	253.3	0.9	42.2				
	Middepth	Ebb	119.4	97.3	1.8	64.1				
		Flood	169.0	264.5	3.7	65.5				
	Near Bottom	Ebb	56.3	63.5	1.1	27.6				
		Flood	233.1	261.6	0.5	39.0				
2/1-2/28	Near Surface	Ebb	0	94.9	0	50.1	2.6	3.7	16.2	24.6
		Flood	153.4	286.4	0.2	45.8				
	Middepth	Ebb	146.3	98.6	0.7	55.1				
		Flood	71.6	274.8	0.3	57.6				

(Sheet 3 of 5)

Table 12 (Continued)

			Velocity				Head of Water Above Instrument		Temperature	
			Direction		Magnitude					
Time Period	Depth	Flow Direction	Minimum deg	Maximum deg	Minimum cm/sec	Maximum cm/sec	Minimum m	Maximum m	Minimum °C	Maximum °C
2/1-2/28 (Cont)	Near Bottom	Ebb	71.6	69.0	0.6	30.1				
		Flood	0	254.7	0.6	31.1				
3/1-3/31	Near Surface	Ebb	0	131.8	0.1	42.1	2.6	3.7	18.0	24.8
		Flood	84.8	269.0	1.1	45.1				
	Middepth	Ebb	180.0	110.3	0.8	51.1				
		Flood	284.7	268.4	2.0	60.7				
	Near Bottom	Ebb	270.0	68.9	0.3	30.0				
		Flood	180.0	268.2	0.8	31.3				
4/1-4/30	Near Surface	Ebb	146.3	97.6	0.7	43.6	2.6	3.6	21.2	27.1
		Flood	90.0	255.8	0.3	41.1				
	Middepth	Ebb	270.0	48.8	0.1	63.5				
		Flood	180.0	257.7	0.6	66.8				
	Near Bottom	Ebb	188.1	300.2	0.7	32.8				
		Flood	90.0	260.2	0.3	31.7				
5/1-5/31	Near Surface	Ebb	21.8	52.4	0.5	45.2	2.6	3.5	25.0	29.9
		Flood	10.3	253.4	1.1	36.7				
	Middepth	Ebb	251.6	44.8	0.3	52.0				
		Flood	0	279.2	0.1	58.7				

(Sheet 4 of 5)

Table 12 (Concluded)

			Velocity				Head of Water Above Instrument		Temperature	
			Direction		Magnitude					
Time Period	Depth	Flow Direction	Minimum deg	Maximum deg	Minimum cm/sec	Maximum cm/sec	Minimum m	Maximum m	Minimum °C	Maximum °C
5/1-5/31 (Cont)	Near Bottom	Ebb	10.3	170.5	1.1	36.4				
		Flood	219.1	197.8	2.1	52.3				
6/1-6/30	Near Surface	Ebb	270.0	78.2	0.2	39.7	2.5	3.5	28.2	33.4
		Flood	0	355.2	0.3	39.2				
	Middepth	Ebb	270.0	45.1	0.2	60.2				
		Flood	270.0	262.6	0.1	62.5				
	Near Bottom	Ebb	16.7	106.3	1.0	41.0				
		Flood	270.0	278.5	0.6	44.8				
7/1-7/31	Near Surface	Ebb	45.0	351.7	0.6	58.5	2.5	3.4	29.3	33.1
		Flood	296.6	275.2	0.2	41.6				
	Middepth	Ebb	40.6	76.1	0.9	58.4				
		Flood	45.0	264.0	1.0	63.4				
	Near Bottom	Ebb	90.0	9.7	1.2	36.7				
		Flood	270.0	245.9	0.3	29.1				

(Sheet 5 of 5)

Table 13
Biscayne Bay, Station 4 (ADP4), Acoustic Doppler Profiler Data Summary[1]

Time Period	Depth	Flow Direction[2]	Velocity[3]				Head of Water Above Instrument[4]		Temperature[5]	
			Direction		Magnitude					
			Minimum deg	Maximum deg	Minimum cm/sec	Maximum cm/sec	Minimum m	Maximum m	Minimum °C	Maximum °C
1997										
6/26-6/30	Near Surface	Ebb	26.6	84.8	0.4	36.6	3.1	3.9	29.8	31.7
		Flood	119.1	262.6	1.0	37.8				
	Middepth	Ebb	18.4	61.0	0.3	37.5				
		Flood	276.3	267.4	2.7	52.8				
	Near Bottom	Ebb	56.3	82.3	0.4	30.7				
		Flood	54.5	265.0	0.9	29.8				
7/1-7/14	Near Surface	Ebb	105.9	63.5	0.7	54.1	3.0	3.8	29.2	39.4
		Flood	303.7	62.2	0.4	53.6				
	Middepth	Ebb	155.1	96.9	4.5	29.1				
		Flood	0.0	265.2	0.2	55.2				
	Near Bottom	Ebb	315.0	84.5	0.4	35.8				
		Flood	135.0	253.8	0.1	37.9				

Note: The instrument pressure transducer at this station failed in July 1997. Ebb/flood direction and magnitude assignments could not be made for the station for the remainder of the study. Pressure transducer failure also makes depth assignment of velocity bins problematic. ADP data for this problematic station are presented in Plates 63-79.
[1]Quantities are for available data during the time period indicated.
[2]Ebb and flood determination is discussed in text.
[3]Minimum (maximum) velocity in each row is for the minimum (maximum) velocity magnitude in that row. North is 0°, increasing clockwise. Direction indicates direction to which current moves.
[4]Pressure head above instrument (uncorrected) only.
[5]Temperatures are all near bottom

Table 14
Biscayne Bay, Station 5 (ADP5), Acoustic Doppler Profiler Data Summary[1]

Time Period	Depth	Flow Direction[2]	Velocity[3]				Head of Water Above Instrument[4]		Temperature[5]	
			Direction		Magnitude					
			Minimum deg	Maximum deg	Minimum cm/sec	Maximum cm/sec	Minimum m	Maximum m	Minimum °C	Maximum °C
1997										
6/28-6/30	Near Surface	Ebb	211.9	198.4	5.3	26.0	3.4	4.2	30.1	32.3
		Flood	18.4	31.7	0.6	56.2				
	Middepth	Ebb	131.2	263.7	3.2	24.6				
		Flood	99.5	46.9	0.6	50.3				
	Near Bottom	Ebb	128.7	263.7	1.9	22.6				
		Flood	61.4	56.9	5.0	43.4				
7/1-7/31	Near Surface	Ebb	150.9	207.0	1.0	35.5	3.4	4.4	29.6	32.4
		Flood	330.9	35.2	1.0	67.6				
	Middepth	Ebb	84.8	241.3	1.1	32.3				
		Flood	0	37.2	0	57.9				
	Near Bottom	Ebb	135.0	237.5	0.1	51.0				
		Flood	135.0	41.2	0.3	48.9				
8/1-8/31	Near Surface	Ebb	116.6	226.9	0.2	43.3	3.3	4.4	28.9	32.7
		Flood	116.6	33.9	0.7	64.8				
	Middepth	Ebb	243.4	234.7	0.7	28.4				
		Flood	225.0	46.6	0.1	59.9				
	Near Bottom	Ebb	270.0	265.6	0.6	148.8				

(Sheet 1 of 5)

[1]Quantities are for available data during the time period indicated.
[2]Ebb and flood determination is discussed in text.
[3]Minimum (maximum) velocity in each row is for the minimum (maximum) velocity magnitude in that row. North is 0°, increasing clockwise. Direction indicates direction to which current moves.
[4]Pressure head above instrument (uncorrected) only.
[5]Temperatures are all near bottom

Table 14 (Continued)

			Velocity				Head of Water Above Instrument		Temperature	
			Direction		Magnitude					
Time Period	Depth	Flow Direction	Minimum deg	Maximum deg	Minimum cm/sec	Maximum cm/sec	Minimum m	Maximum m	Minimum °C	Maximum °C
8/1-8/31 (Cont)	Near Bottom (Cont)	Flood	291.8	140.0	0.5	117.8				
9/1-9/30	Near Surface	Ebb	315.0	187.9	0.1	39.9	3.4	4.4	26.9	30.8
		Flood	168.7	33.4	0.5	64.5				
	Middepth	Ebb	80.5	238.5	0.6	33.9				
		Flood	225.0	36.5	0.3	64.1				
	Near Bottom	Ebb	270.0	18.4	0.6	133.2				
		Flood	33.7	31.1	0.4	88.0				
10/1-10/31	Near Surface	Ebb	260.5	180.5	0.6	48.3	3.4	4.6	24.5	29.5
		Flood	99.5	37.9	0.6	70.1				
	Middepth	Ebb	0	252.4	0	30.8				
		Flood	90.0	42.5	0.1	64.3				
	Near Bottom	Ebb	18.4	197.3	0.3	62.9				
		Flood	180.0	45.4	0.6	55.6				
11/1-11/30	Near Surface	Ebb	333.4	214.3	0.2	36.3	3.5	4.9	21.9	27.0
		Flood	248.2	50.9	0.5	70.4				
	Middepth	Ebb	0	197.0	0.5	39.0				
		Flood	0	47.2	0.2	67.8				
	Near Bottom	Ebb	270.0	243.2	0.6	78.5				

(Sheet 2 of 5)

Table 14 (Continued)

Time Period	Depth	Flow Direction	Velocity				Head of Water Above Instrument		Temperature	
			Direction		Magnitude					
			Minimum deg	Maximum deg	Minimum cm/sec	Maximum cm/sec	Minimum m	Maximum m	Minimum °C	Maximum °C
11/1-11/30 (Cont)	Near Bottom (Cont)	Flood	270.0	50.3	0.6	56.4				
12/1-12/31	Near Surface	Ebb	341.6	220.7	0.3	34.0	3.7	5.0	18.4	24.7
		Flood	50.2	48.4	0.8	67.5				
	Middepth	Ebb	333.4	250.8	0.4	30.4				
		Flood	90.0	48.3	0.7	66.3				
	Near Bottom	Ebb	45.0	211.3	0.1	27.5				
		Flood	284.0	54.4	0.4	55.0				
1998										
1/1-1/31	Near Surface	Ebb	180.0	230.8	0.2	46.3	3.4	4.9	17.2	24.8
		Flood	333.4	51.2	0.9	64.5				
	Middepth	Ebb	33.7	176.3	0.4	57.5				
		Flood	15.9	49.4	0.7	64.8				
	Near Bottom	Ebb	243.4	340.2	0.4	164.9				
		Flood	189.5	349.8	0.6	148.4				
2/1-2/28	Near Surface	Ebb	341.6	217.2	0.6	45.8	3.4	4.6	17.0	24.8
		Flood	270.0	52.9	0.5	67.6				
	Middepth	Ebb	206.6	340.1	0.2	54.4				
		Flood	256.0	56.1	1.2	56.3				

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Table 14 (Continued)

Time Period	Depth	Flow Direction	Velocity: Direction Minimum deg	Velocity: Direction Maximum deg	Velocity: Magnitude Minimum cm/sec	Velocity: Magnitude Maximum cm/sec	Head of Water Above Instrument Minimum m	Head of Water Above Instrument Maximum m	Temperature Minimum °C	Temperature Maximum °C
2/1-2/28 (Cont)	Near Bottom	Ebb	167.0	336.2	1.3	198.1				
		Flood	299.7	350.4	0.8	192.4				
3/1-3/31	Near Surface	Ebb	81.6	247.0	2.7	37.1	3.4	4.7	21.3	25.9
		Flood	346.0	32.1	0.4	72.2				
	Middepth	Ebb	135.0	248.1	0.7	30.0				
		Flood	212.0	46.5	0.9	67.1				
	Near Bottom	Ebb	155.6	338.4	1.2	140.5				
		Flood	0	349.3	0.7	131.4				
4/1-4/30	Near Surface	Ebb	288.4	140.4	0.3	42.3	3.5	4.6	21.5	26.9
		Flood	305.0	40.5	1.2	73.1				
	Middepth	Ebb	0	38.0	0	40.0				
		Flood	153.4	45.0	0.2	65.2				
	Near Bottom	Ebb	288.4	154.6	0.3	107.0				
		Flood	192.5	144.4	0.9	107.9				
5/1-5/31	Near Surface	Ebb	0	25.3	0.2	36.5	3.4	4.4	25.2	29.9
		Flood	180.0	49.1	0.1	60.5				
	Middepth	Ebb	270.0	37.7	0.1	40.6				
		Flood	333.4	50.0	0.4	58.6				

(Sheet 4 of 5)

Table 14 (Concluded)

			Velocity				Head of Water Above Instrument		Temperature	
			Direction		Magnitude					
Time Period	Depth	Flow Direction	Minimum deg	Maximum deg	Minimum cm/sec	Maximum cm/sec	Minimum m	Maximum m	Minimum °C	Maximum °C
5/1-5/31 (Cont)	Near Bottom	Ebb	270.0	341.9	0.3	95.9				
		Flood	180.0	358.3	0.8	91.9				
6/1-6/30	Near Surface	Ebb	284.0	230.1	0.4	82.3	3.3	4.4	28.2	33.0
		Flood	180.0	43.0	0.2	57.5				
	Middepth	Ebb	0	230.3	0.1	57.0				
		Flood	26.6	49.3	0.4	59.9				
	Near Bottom	Ebb	180.0	329.2	0.7	132.5				
		Flood	102.5	300.2	0.9	99.7				
7/1-7/31	Near Surface	Ebb	45.0	260.6	0.1	34.8	3.3	4.4	29.7	32.7
		Flood	198.4	44.3	0.3	61.6				
	Middepth	Ebb	306.9	61.7	0.5	30.0				
		Flood	135.0	49.0	0.3	55.8				
	Near Bottom	Ebb	0	308.2	0.1	95.2				
		Flood	198.4	279.3	0.3	81.1				

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Table 15
Biscayne Bay, Station 1 (CTD1), Data Summary

Time Period	Data Range	Temperature °C	Specific Conductivity mS/cm	Salinity ppt	Dissolved Oxygen[1] %	Dissolved Oxygen[1] mg/l	Water Surface Elevation NGVD 1929 ft
1997							
6/6-6/30	Mean[2]	30.25	40.31	25.65	99.67	6.51	1.01
	Minimum[3]	26.39	32.67	20.30	13.20	.88	0.44
	Maximum[3]	32.86	51.99	34.09	210.70	13.88	1.90
7/1-7/31	Mean	31.28	35.18	21.99	110.72	7.25	0.94
	Minimum	29.75	29.19	17.88	27.00	1.77	0.45
	Maximum	33.61	39.49	24.98	198.90	12.91	1.52
8/1-8/31	Mean	31.56	35.43	22.16	104.84	6.82	0.96
	Minimum	28.44	30.34	18.65	9.20	.60	0.51
	Maximum	33.80	38.83	24.54	259.80	16.72	1.49
9/1-9/30	Mean	29.30	34.42	21.52	99.49	6.75	0.96
	Minimum	27.70	24.54	14.85	17.40	1.18	-0.05
	Maximum	31.28	40.41	25.67	198.30	13.18	1.71
10/1-10/31	Mean	26.83	35.37	22.23	104.86	7.40	0.91
	Minimum	24.02	29.72	18.29	24.40	1.64	0.14
	Maximum	30.53	40.07	25.56	172.90	12.54	1.77
11/1-11/30	Mean	24.03	37.04	23.45	106.08	7.80	0.59
	Minimum	21.67	32.80	20.51	58.10	4.28	-0.08
	Maximum	28.01	40.71	26.06	150.00	11.14	1.20
12/1-12/31	Mean	21.63	35.31	22.27	116.31	9.00	0.50
	Minimum	16.93	29.83	18.50	62.00	4.67	-0.09
	Maximum	26.18	40.39	25.83	185.70	14.85	1.36
1998							
1/1-1/31	Mean	21.91	34.95	22.02	110.04	8.48	0.73
	Minimum	17.47	30.88	19.23	56.40	4.09	0.03
	Maximum	25.83	37.70	23.98	177.90	13.79	1.61

(Continued)

[1] Dissolved oxygen quantities are presented "as is" with no QA/QC other than eliminating negative values.
[2] Mean values are averages for all appropriate data during the time period.
[3] Minimum (maximum) value is the minimum (maximum) value for the quantity during the time period.

Table 15 (Concluded)							
Time Period	Data Range	Temperature °C	Specific Conductivity mS/cm	Salinity ppt	Dissolved Oxygen %	Dissolved Oxygen mg/l	Water Surface Elevation NGVD 1929 ft
2/1-2/28	Mean	21.42	32.51	20.65	113.96	8.97	0.64
	Minimum	16.72	27.82	17.27	59.90	4.75	-0.32
	Maximum	26.86	37.55	23.85	190.60	14.12	2.18
3/1-3/31	Mean	22.22	31.78	*	118.78	9.22	0.65
	Minimum	17.75	26.52	*	53.50	4.13	-0.01
	Maximum	25.50	36.94	*	247.70	18.90	1.45
4/1-4/30	Mean	25.16	35.29	22.21	113.59	8.24	0.54
	Minimum	21.12	29.50	18.19	45.60	3.26	-0.22
	Maximum	28.36	39.75	25.32	172.50	12.03	1.34
5/1-5/31	Mean	28.64	38.94	24.69	114.81	7.74	0.69
	Minimum	25.71	33.37	20.81	33.50	2.25	-0.06
	Maximum	30.77	42.19	27.01	234.20	15.69	1.43
6/1-6/30	Mean	31.64	40.72	25.85	116.43	7.42	0.44
	Minimum	29.23	37.41	23.55	47.30	3.00	-0.06
	Maximum	33.88	43.31	27.70	204.80	12.73	1.40

* No data available.

Table 16
Biscayne Bay, Station 2 (CTD2), Data Summary

Time Period	Data Range	Temperature °C	Specific Conductivity mS/cm	Salinity ppt	Dissolved Oxygen[1] %	Dissolved Oxygen[1] mg/l	Water Surface Elevation NGVD 1929 ft
1997							
6/13-6/30	Mean[2]	30.51	38.10	24.05	99.27	6.51	1.24
	Minimum[3]	28.70	35.16	21.98	60.10	4.05	0.71
	Maximum[3]	32.28	43.08	27.60	138.90	9.04	1.87
7/1-7/31	Mean	30.89	38.54	24.34	96.77	6.30	1.26
	Minimum	29.30	32.99	20.48	50.70	3.33	0.63
	Maximum	33.29	42.83	27.36	154.90	9.99	1.88
8/1-8/31	Mean	31.38	39.99	25.06	97.01	6.10	1.22
	Minimum	28.68	35.57	22.24	.40	3.95	0.66
	Maximum	33.58	45.58	29.29	146.60	9.13	2.02
9/1-9/30	Mean	28.85	39.01	*	66.62	6.14	1.37
	Minimum	27.26	30.15	*	99.90	3.97	0.54
	Maximum	30.59	46.07	*	0.00	8.86	2.07
10/1-10/31	Mean	26.10	40.38	26.21	35.49	5.97	1.51
	Minimum	23.42	32.32	23.51	116.80	0.00	0.60
	Maximum	28.90	47.37	29.30	0.00	9.61	2.56
11/1-11/30	Mean	23.94	41.42	26.55	67.11	4.85	1.07
	Minimum	21.74	37.24	23.58	33.70	2.38	0.40
	Maximum	27.81	47.23	30.76	128.20	9.27	1.80
12/1-12/31	Mean	21.33	37.99	24.15	109.73	8.44	0.97
	Minimum	17.10	32.42	20.25	90.00	6.75	0.39
	Maximum	25.65	44.20	28.55	143.70	10.74	1.81
1998							
1/1-1/31	Mean	21.75	39.01	24.87	130.77	9.95	1.13
	Minimum	17.66	35.32	22.29	100.50	7.31	0.60
	Maximum	25.55	42.02	27.02	171.10	13.36	2.13

(Continued)

* No data available
[1]Dissolved oxygen quantities are presented "as is" with no QA/QC other than eliminating negative values.
[2] Mean values are averages for all appropriate data during the time period.
[3] Minimum (maximum) value is the minimum (maximum) value for the quantity during the time period.

Table 16 (Concluded)							
Time Period	Data Range	Temperature °C	Specific Conductivity mS/cm	Salinity ppt	Dissolved Oxygen %	Dissolved Oxygen mg/l	Water Surface Elevation NGVD 1929 ft
2/1-2/28	Mean	21.18	35.95	22.73	124.04	9.76	1.24
	Minimum	16.67	32.04	19.99	36.50	2.68	0.32
	Maximum	26.01	45.29	29.35	189.70	15.20	2.60
3/1-3/31	Mean	22.21	36.85	23.35	110.42	8.41	1.27
	Minimum	17.83	30.67	19.06	0.20	0.01	0.58
	Maximum	25.84	43.97	28.40	149.30	11.92	2.21
4/1-4/30	Mean	25.13	40.75	26.05	107.53	7.64	0.78
	Minimum	21.50	35.31	22.20	82.40	5.81	0.17
	Maximum	27.84	47.33	30.78	144.30	9.91	1.77
5/1-5/31	Mean	28.46	43.12	27.66	111.80	7.44	0.94
	Minimum	25.92	39.16	24.89	83.00	5.46	0.22
	Maximum	30.34	47.93	31.15	144.60	9.68	1.76
6/1-6/30	Mean	31.29	44.74	28.73	103.27	6.52	0.90
	Minimum	28.77	39.97	25.39	61.50	3.97	0.34
	Maximum	33.41	48.30	31.28	147.10	9.28	1.61

Table 17
Biscayne Bay, Station 3 (CTD3), Data Summary

Time Period	Data Range	Temperature °C	Specific Conductivity mS/cm	Salinity ppt	Dissolved Oxygen[1] %	Dissolved Oxygen[1] mg/l	Water Surface Elevation NGVD 1929 ft
1997							
6/6-6/30	Mean[2]	29.99	50.74	33.14	108.34	6.81	1.11
	Minimum[3]	26.76	40.83	25.96	71.10	4.58	0.52
	Maximum[3]	32.27	56.83	37.64	157.10	9.70	2.08
7/1-7/31	Mean	31.15	53.25	34.95	100.42	6.15	1.07
	Minimum	29.27	40.67	25.84	62.50	3.81	0.48
	Maximum	32.91	59.29	39.46	150.20	9.47	1.76
8/1-8/31	Mean	31.21	53.18	34.89	90.91	5.56	1.06
	Minimum	28.82	45.82	29.49	52.10	3.21	0.47
	Maximum	32.85	55.94	36.91	137.40	8.42	1.77
9/1-9/30	Mean	29.10	50.27	32.82	97.51	6.24	1.11
	Minimum	27.28	37.57	23.70	59.80	3.79	0.17
	Maximum	30.65	54.16	35.71	154.00	9.74	1.97
10/1-10/31	Mean	26.61	50.47	33.04	113.78	7.57	1.17
	Minimum	24.00	37.24	23.50	69.80	4.57	0.41
	Maximum	29.78	53.95	35.64	316.80	20.85	2.20
11/1-11/30	Mean	23.90	51.38	33.77	206.96	14.42	0.94
	Minimum	21.48	45.77	29.64	31.50	2.20	0.21
	Maximum	27.67	54.93	36.38	442.80	31.40	1.85
12/1-12/31	Mean	21.18	49.03	32.08	123.18	8.97	0.71
	Minimum	17.03	42.77	27.56	0.00*	0.00*	0.12
	Maximum	24.91	54.18	35.83	383.60	26.66	1.63
1998							
1/1-1/24	Mean	22.01	49.75	32.60	110.72	8.01	0.69
	Minimum	17.28	44.36	28.69	65.80	4.59	0.15
	Maximum	25.02	52.44	34.58	139.00	10.12	1.36

(Continued)

* No data available.
[1] Disolved oxygen quantities are presented "as is" with no QA/QC other than eliminating negative values.
[2] Mean values are averages for all appropriate data during the time period.
[3] Minimum (maximum) value is the minimum (maximum) value for the quantity during the time period.

Table 17 (Concluded)							
Time Period	Data Range	Temperature °C	Specific Conductivity mS/cm	Salinity ppt	Dissolved Oxygen %	Dissolved Oxygen mg/l	Water Surface Elevation NGVD 1929 ft
2/18-2/28	Mean	23.56	48.83	31.91	102.14	7.22	0.71
	Minimum	20.74	40.08	25.60	79.70	5.47	0.09
	Maximum	25.67	52.86	34.86	121.60	8.74	1.82
3/1-3/31	Mean	21.99	48.85	31.94	108.86	7.92	1.04
	Minimum	17.02	43.08	27.78	82.50	5.80	0.28
	Maximum	25.78	53.04	35.02	140.40	10.38	1.99
4/1-4/30	Mean	24.99	52.21	34.36	106.78	7.25	0.63
	Minimum	20.92	45.92	29.71	62.40	4.13	-0.06
	Maximum	27.86	54.88	36.35	159.60	10.81	1.56
5/1-5/31	Mean	28.37	53.99	35.58	102.90	6.57	0.73
	Minimum	25.90	48.60	31.61	67.70	4.29	0.09
	Maximum	30.18	56.45	37.37	159.10	10.40	1.53
6/1-6/30	Mean	31.29	53.21	34.91	105.66	6.45	0.72
	Minimum	28.77	48.90	31.75	13.60	8.61	0.02
	Maximum	33.25	54.95	36.18	145.50	0.84	1.61

Table 18
Biscayne Bay, Station 4 (CTD4), Data Summary

Time Period	Data Range	Temperature °C	Specific Conductivity mS/cm	Salinity ppt	Dissolved Oxygen[1] %	Dissolved Oxygen[1] mg/l	Water Surface Elevation NGVD 1929 ft
1997							
6/6-6/30	Mean[2]	29.66	47.77	30.99	121.71	7.78	0.49
	Minimum[3]	26.50	42.94	27.50	55.30	3.64	-0.65
	Maximum[3]	32.29	55.73	36.89	184.40	11.47	1.76
7/1-7/31	Mean	30.98	48.19	30.18	88.48	3.45	0.44
	Minimum	29.51	44.72	28.78	0.00	0.00	-0.62
	Maximum	32.58	50.37	31.50	194.30	12.09	1.67
8/1-8/31	Mean	30.91	50.54	33.53	76.15	6.34	0.54
	Minimum	28.43	45.93	31.87	0.00	3.63	-0.55
	Maximum	33.05	53.05	34.87	120.40	7.84	1.79
9/1-9/30	Mean	28.82	46.70	30.23	68.15	4.45	0.77
	Minimum	26.70	40.53	25.81	0.00	0.00	-0.55
	Maximum	30.18	52.37	34.34	137.20	8.91	2.11
10/1-10/31	Mean	26.32	47.40	30.80	109.90	7.46	0.79
	Minimum	23.86	44.29	28.51	25.30	1.65	-0.37
	Maximum	28.94	50.88	33.37	157.20	10.68	2.43
11/1-11/30	Mean	23.65	48.58	31.72	119.40	8.43	0.43
	Minimum	21.69	44.88	29.01	89.20	6.10	-0.75
	Maximum	27.17	50.87	33.39	157.700	11.17	1.88
12/1-12/8	Mean	21.73	46.89	30.51	147.78	10.89	0.22
	Minimum	17.79	44.25	28.60	126.50	9.21	-0.78
	Maximum	24.07	49.43	32.35	192.00	15.11	1.47
1998							
1/7-1/31	Mean	21.80	47.89	31.20	105.43	8.15	0.25
	Minimum	17.47	43.72	28.21	0.00	7.00	-0.87
	Maximum	24.80	51.00	33.53	130.20	9.94	2.03

(Continued)

[1] Dissolved oxygen quantities are presented "as is" with no QA/QC other than eliminating negative values.
[2] Mean values are averages for all appropriate data during the time period.
[3] Minimum (maximum) value is the minimum (maximum) value for the quantity during the time period.

Table 18 (Concluded)							
Time Period	Data Range	Temperature °C	Specific Conductivity mS/cm	Salinity ppt	Dissolved Oxygen %	Dissolved Oxygen mg/l	Water Surface Elevation NGVD 1929 ft
2/1-2/28	Mean	19.45	46.02	*	24.83	9.52	0.44
	Minimum	15.07	43.00	*	0.00	7.77	-0.86
	Maximum	23.96	50.31	*	99.90	12.35	2.35
3/1-3/31	Mean	21.84	46.07	29.91	6.97	0.51	0.17
	Minimum	17.66	38.91	24.73	0.00	0.00	-1.03
	Maximum	25.90	50.13	32.91	162.60	11.88	1.68
4/1-4/30	Mean	24.79	51.34	33.73	80.23	5.49	0.22
	Minimum	21.11	41.41	26.51	0.00	0.00	-1.14
	Maximum	27.24	55.20	36.58	119.10	8.12	1.65
5/1-5/31	Mean	28.10	55.81	36.95	90.80	5.77	0.40
	Minimum	25.50	53.54	35.35	22.30	1.41	-0.82
	Maximum	30.12	57.52	38.22	308.50	18.98	1.78
6/1-6/30	Mean	31.11	54.74	36.05	63.37	3.85	0.50
	Minimum	28.40	52.90	34.71	30.20	1.82	-0.70
	Maximum	33.33	56.03	37.03	135.50	8.20	1.97

* No data available

Table 19
Biscayne Bay, Station 5 (CTD5), Data Summary

Time Period	Data Range	Temperature °C	Specific Conductivity mS/cm	Salinity ppt	Dissolved Oxygen[1] %	Dissolved Oxygen[1] mg/l	Water Surface Elevation NGVD 1929 ft
1997							
6/6-6/10	Mean[2]	28.61	40.83	26.04	109.74	7.28	0.72
	Minimum[3]	25.50	26.86	16.43	33.20	2.28	-0.59
	Maximum[3]	31.48	45.03	29.01	214.10	13.58	1.87
7/10-7/31	Mean	31.34	35.84	22.46	150.98	9.85	0.73
	Minimum	28.98	23.72	14.25	4.10	0.26	-0.14
	Maximum	33.66	39.75	25.18	347.40	22.68	1.92
8/1-8/31	Mean	31.14	36.43	22.88	107.85	7.07	0.79
	Minimum	27.92	23.65	14.17	0.10	0.00	-0.30
	Maximum	35.33	44.81	28.78	429.90	27.54	2.07
9/1-9/30	Mean	29.17	29.83	18.42	113.84	7.86	0.96
	Minimum	26.25	15.83	9.21	28.40	1.90	-0.40
	Maximum	31.62	41.33	26.35	291.50	19.75	2.34
10/1-10/31	Mean	26.69	32.60	20.25	110.98	8.04	0.90
	Minimum	23.74	16.01	9.33	0.50	2.49	-0.23
	Maximum	30.44	39.71	25.30	253.40	17.34	2.56
11/1-11/30	Mean	23.78	38.20	*	45.26	8.03	0.84
	Minimum	21.22	30.65	*	0.00	2.70	0.13
	Maximum	27.70	42.63	*	99.90	17.76	2.15
12/1-12/31	Mean	21.50	32.21	19.97	111.95	9.47	0.50
	Minimum	16.41	25.23	15.40	0.40	3.42	-0.27
	Maximum	26.99	36.96	23.45	237.10	17.54	1.79
1998							
1/1-1/31	Mean	21.75	32.04	20.05	121.09	9.48	0.55
	Minimum	15.49	13.77	7.95	61.90	4.51	-0.24
	Maximum	26.44	41.09	26.32	245.50	18.57	2.30

(Continued)

* No data available.
[1] Dissolved oxygen quantities are presented "as is" with no QA/QC other than eliminating negative values.
[2] Mean values are averages for all appropriate data during the time period.
[3] Minimum (maximum) value is the minimum (maximum) value for the quantity during the time period.

Table 19 (Concluded)							
Time Period	Data Range	Temperature °C	Specific Conductivity mS/cm	Salinity ppt	Dissolved Oxygen %	Dissolved Oxygen mg/l	Water Surface Elevation NGVD 1929 ft
2/1-2/28	Mean	21.34	32.38	20.25	119.36	9.40	0.82
	Minimum	15.97	20.60	12.36	24.40	1.80	-0.37
	Maximum	27.11	40.00	25.54	242.70	18.31	2.82
3/1-3/31	Mean	22.12	31.35	19.55	120.10	9.36	0.74
	Minimum	16.35	18.63	11.02	61.10	4.58	-0.21
	Maximum	25.66	41.14	26.33	237.80	18.13	2.42
4/1-4/30	Mean	25.12	42.16	27.16	120.12	8.47	0.51
	Minimum	19.47	13.08	7.51	49.40	3.44	-0.31
	Maximum	28.63	52.82	34.77	209.80	14.29	1.89
5/1-5/31	Mean	28.43	52.45	34.44	119.03	7.61	0.70
	Minimum	24.97	46.01	29.77	55.60	3.60	-0.25
	Maximum	31.62	56.53	37.50	199.00	12.27	2.21
6/1-6/30	Mean	31.39	52.64	34.48	139.06	8.47	0.76
	Minimum	28.20	47.61	30.82	16.50	1.03	-0.39
	Maximum	35.00	55.39	36.47	249.10	14.40	2.15

Table 20
Biscayne Bay, Station 6 (CTD6), Data Summary

Time Period	Data Range	Temperature °C	Specific Conductivity mS/cm	Salinity ppt	Dissolved Oxygen[1] %	Dissolved Oxygen[1] mg/l	Water Surface Elevation NGVD 1929 ft
1997							
6/6-6/30	Mean[2]	29.93	31.14	19.30	128.19	8.69	0.73
	Minimum[3]	25.92	11.12	6.28	55.10	3.77	-0.50
	Maximum[3]	33.38	44.38	28.55	231.90	15.59	1.99
7/1-7/31	Mean	31.18	35.44	22.19	116.05	7.60	0.67
	Minimum	29.23	19.35	11.40	60.40	4.10	-0.44
	Maximum	33.61	42.14	26.87	231.30	14.87	1.93
8/1-8/31	Mean	30.67	35.99	22.58	109.23	7.19	0.77
	Minimum	27.96	22.00	13.14	47.50	3.21	-0.37
	Maximum	33.84	44.10	28.27	212.90	13.70	2.06
9/1-9/30	Mean	28.84	30.96	19.19	102.97	7.13	0.91
	Minimum	26.41	12.55	7.15	56.80	3.88	-0.48
	Maximum	30.69	42.65	27.32	202.00	13.82	2.24
10/1-10/31	Mean	26.56	36.02	22.71	125.13	8.83	1.41
	Minimum	23.61	20.43	12.15	57.70	4.07	-0.27
	Maximum	30.16	43.72	28.14	225.90	15.68	3.16
11/1-11/30	Mean	23.71	39.36	25.09	114.95	8.42	0.67
	Minimum	21.18	30.42	18.88	70.60	5.06	-0.61
	Maximum	27.45	44.60	28.84	179.00	13.26	2.18
12/1-12/31	Mean	20.59	31.22	22.51	56.93	10.82	0.37
	Minimum	16.09	16.24	15.83	0.00	5.53	-0.93
	Maximum	25.65	41.29	26.46	172.10	19.50	1.75
1998							
1/1-1/31	Mean	20.62	31.42	21.08	57.84	12.65	0.44
	Minimum	15.10	16.64	16.16	0.00	8.06	-0.92
	Maximum	24.94	40.86	24.46	137.80	18.98	2.30

(Continued)

[1] Dissolved oxygen quantities are presented "as is" with no QA/QC other than eliminating negative values.
[2] Mean values are averages for all appropriate data during the time period.
[3] Minimum (maximum) value is the minimum (maximum) value for the quantity during the time period.

Table 20 (Concluded)							
Time Period	Data Range	Temperature °C	Specific Conductivity mS/cm	Salinity ppt	Dissolved Oxygen %	Dissolved Oxygen mg/l	Water Surface Elevation NGVD 1929 Ft
2/1-2/28	Mean	21.27	30.46	18.95	117.87	9.35	0.68
	Minimum	16.52	16.23	9.53	85.60	6.30	-0.73
	Maximum	26.48	41.16	26.40	183.70	14.32	2.77
3/1-3/31	Mean	22.36	32.22	20.15	126.56	9.79	0.67
	Minimum	17.15	13.52	7.79	84.80	6.32	-0.63
	Maximum	26.78	41.34	26.52	185.30	14.76	2.29
4/1-4/30	Mean	25.00	39.04	24.90	124.23	8.90	0.42
	Minimum	20.33	17.62	10.35	85.40	5.95	-0.73
	Maximum	28.03	53.00	34.90	186.10	13.16	1.79
5/1-5/31	Mean	28.37	49.93	32.60	116.70	7.56	0.52
	Minimum	25.28	39.55	25.18	59.00	3.88	-0.80
	Maximum	31.30	55.91	37.01	180.40	11.25	1.87
6/1-6/30	Mean	31.30	51.63	33.75	123.57	7.58	0.41
	Minimum	28.46	43.94	28.19	56.80	3.63	-0.78
	Maximum	34.60	55.61	36.61	202.00	12.44	1.85

Table 21
Biscayne Bay, Station 7 (CTD7), Data Summary

Time Period	Data Range	Temperature °C	Specific Conductivity mS/cm	Salinity ppt	Dissolved Oxygen[1] %	Dissolved Oxygen[1] mg/l	Water Surface Elevation NGVD 1929 ft
1997							
6/6-6/30	Mean[2]	35.70	*	*	180.39	10.41	*
	Minimum[3]	22.81	*	*	40.60	2.44	*
	Maximum[3]	41.16	*	*	302.50	17.05	*
7/01-7/29	Mean	33.83	47.63	28.18	152.35	8.89	1.00
	Minimum	29.85	36.67	23.03	67.40	4.22	-0.32
	Maximum	41.03	65.79	30.24	315.60	17.13	2.40
9/10-9/30	Mean	29.07	38.32	24.25	98.39	6.60	0.90
	Minimum	27.45	29.57	18.20	43.90	2.89	-0.61
	Maximum	30.25	44.72	28.80	176.50	11.48	2.52
10/1-10/31	Mean	26.59	40.64	25.95	100.08	6.94	0.88
	Minimum	23.95	33.59	20.99	54.30	3.62	-0.57
	Maximum	29.90	46.47	30.15	151.20	10.35	2.67
11/1-11/30	Mean	23.73	45.15	29.22	92.57	6.62	0.61
	Minimum	21.51	39.55	25.16	38.00	2.60	-0.98
	Maximum	27.16	50.89	33.41	136.60	9.84	2.31
12/1-12/31	Mean	21.11	42.09	27.04	113.43	8.62	0.38
	Minimum	17.11	34.80	21.85	79.90	6.01	-1.15
	Maximum	25.12	50.47	33.10	156.90	11.52	1.97
1998							
1/1-1/31	Mean	21.67	40.85	26.17	109.09	8.26	0.46
	Minimum	17.07	33.77	21.15	0.10	0.00	-1.28
	Maximum	25.20	45.37	29.44	188.30	14.64	2.39
2/1-2/28	Mean	21.33	38.68	24.64	109.22	8.42	0.61
	Minimum	16.43	34.32	21.57	62.10	4.83	-1.02
	Maximum	25.14	44.48	28.81	142.40	11.25	2.81

(Continued)

* Data questionable. Depths reported at 300 ft.
[1] Dissolved oxygen quantities are presented "as is" with no QA/QC other than eliminating negative values.
[2] Mean values are averages for all appropriate data during the time period.
[3] Minimum (maximum) value is the minimum (maximum) value for the quantity during the time period.

Table 21 (Concluded)							
Time Period	Data Range	Temperature °C	Specific Conductivity mS/cm	Salinity ppt	Dissolved Oxygen %	Dissolved Oxygen mg/l	Water Surface Elevation NGVD 1929 ft
3/1-3/31	Mean	22.29	42.02	27.00	113.03	8.41	0.56
	Minimum	18.28	31.90	19.86	82.00	5.81	-0.97
	Maximum	26.39	46.86	30.47	156.40	11.82	2.49
4/1-4/30	Mean	25.04	46.04	29.86	106.73	7.43	0.44
	Minimum	21.10	32.92	20.52	71.70	5.05	-0.92
	Maximum	27.58	52.51	34.60	180.50	12.52	1.91
5/1-5/31	Mean	28.31	51.50	33.75	114.01	7.34	0.55
	Minimum	26.05	45.66	29.45	69.70	4.49	-0.94
	Maximum	30.50	55.85	36.96	175.80	11.08	2.06
6/1-6/30	Mean	31.06	53.69	35.27	130.38	7.97	0.45
	Minimum	28.34	50.18	32.70	83.80	5.16	-0.96
	Maximum	33.58	55.94	36.92	186.90	11.27	2.12

Table 22
Biscayne Bay, Station 8 (CTD8), Data Summary

Time Period	Data Range	Temperature °C	Specific Conductivity mS/cm	Salinity ppt	Dissolved Oxygen[1] %	Dissolved Oxygen[1] mg/l	Water Surface Elevation NGVD 1929 ft
1997							
6/12-6/30	Mean[2]	30.30	38.94	24.66	119.96	7.87	0.82
	Minimum[3]	27.51	34.38	21.47	62.10	4.09	-0.55
	Maximum[3]	32.55	47.82	31.06	197.00	12.64	2.26
7/1-7/31	Mean	31.20	44.27	28.40	111.01	7.04	0.78
	Minimum	29.51	40.01	25.38	47.70	3.02	-0.60
	Maximum	33.15	48.87	31.68	207.30	13.21	2.27
8/1-8/31	Mean	31.16	47.44	30.03	64.57	6.15	0.78
	Minimum	28.66	43.12	27.63	0.00	3.71	-0.61
	Maximum	33.30	49.96	32.05	137.00	9.51	2.40
9/1-9/30	Mean	29.03	43.12	27.66	91.89	6.06	1.01
	Minimum	27.10	34.92	21.85	48.90	3.24	-0.55
	Maximum	30.18	49.61	32.33	138.80	9.17	2.62
10/1-10/31	Mean	26.72	42.47	27.25	105.78	7.27	1.07
	Minimum	24.87	33.47	20.92	69.90	4.58	-0.37
	Maximum	29.48	46.65	30.23	146.10	10.40	3.00
11/1-11/30	Mean	23.75	47.04	30.59	91.70	6.50	0.78
	Minimum	21.95	43.56	28.04	66.30	4.60	-0.86
	Maximum	27.07	49.71	32.52	138.80	9.33	2.48
12/1-12/31	Mean	21.27	44.98	30.44	56.15	9.40	0.54
	Minimum	18.39	40.81	29.03	0.30	4.46	-1.04
	Maximum	24.34	48.54	31.70	113.30	16.01	2.11

(Continued)

[1] Dissolved oxygen quantities are presented "as is" with no QA/QC other than eliminating negative values.
[2] Mean values are averages for all appropriate data during the time period.
[3] Minimum (maximum) value is the minimum (maximum) value for the quantity during the time period.

Table 22 (Concluded)							
Time Period	Data Range	Temperature °C	Specific Conductivity mS/cm	Salinity ppt	Dissolved Oxygen %	Dissolved Oxygen mg/l	Water Surface Elevation NGVD 1929 ft
			1998				
1/1-1/31	Mean	21.73	43.84	*	49.90	14.72	0.51
	Minimum	17.84	38.91	*	0.00	11.12	-1.30
	Maximum	24.81	48.31	*	99.90	20.06	2.49
2/1-2/28	Mean	20.81	42.12	26.90	101.71	10.28	0.73
	Minimum	16.95	35.81	22.63	0.30	6.76	-0.89
	Maximum	24.86	45.95	28.52	154.70	19.51	2.80
3/1-3/31	Mean	22.28	42.48	27.33	120.19	8.93	0.67
	Minimum	19.01	36.92	23.37	79.50	6.03	-0.80
	Maximum	25.82	48.65	31.76	156.80	11.68	2.41
4/1-4/30	Mean	24.57	47.68	31.05	118.95	8.30	0.55
	Minimum	21.49	38.43	24.41	20.60	1.43	-0.83
	Maximum	27.44	51.94	34.18	172.20	11.78	2.02
5/1-5/31**	Mean	27.54	52.07	34.19	104.60	6.06	0.70
	Minimum	24.11	38.43	31.46	45.70	2.31	-0.94
	Maximum	30.11	54.19	35.73	173.60	11.61	2.28
6/1-6/29	Mean	31.13	53.68	35.26	141.27	8.62	0.60
	Minimum	28.42	50.74	33.07	81.20	5.18	-0.89
	Maximum	33.33	55.37	36.46	203.40	12.15	2.33

* No data available.
** Temperature, specific conductivity, and salinity data questionable during 5/10/98 (1400) to 5/21/98 (1015) and not used in averages.

Table 23
Biscayne Bay, Station 9 (CTD9), Data Summary

Time Period	Data Range	Temperature °C	Specific Conductivity mS/cm	Salinity ppt	Dissolved Oxygen[1] %	Dissolved Oxygen[1] mg/l	Water Surface Elevation NGVD 1929 ft
1997							
6/12-6/30	Mean[2]	29.50	48.94	31.83	109.51	7.00	0.54
	Minimum[3]	27.00	42.76	27.38	80.20	5.30	-0.94
	Maximum[3]	32.04	53.31	35.10	157.10	9.80	1.98
7/1-7/31	Mean	30.69	51.18	33.44	105.27	6.54	0.51
	Minimum	29.10	45.02	28.95	58.90	3.69	-0.91
	Maximum	32.43	54.31	35.72	163.00	9.96	2.10
8/1-8/31	Mean	30.85	53.12	34.86	93.48	5.70	0.51
	Minimum	28.70	50.19	32.75	0.00	0.00	-1.02
	Maximum	32.61	55.25	36.41	148.60	8.89	2.30
9/1-9/30	Mean	28.80	50.16	32.75	94.50	6.08	0.78
	Minimum	26.09	45.16	29.13	26.60	1.71	-0.79
	Maximum	30.12	54.01	35.53	164.60	10.42	2.51
10/1-10/31	Mean	26.59	50.69	33.20	103.97	6.92	0.79
	Minimum	23.62	45.66	29.50	68.90	4.56	-0.65
	Maximum	29.61	54.61	36.09	161.80	10.86	2.75
11/1-11/30	Mean	24.03	52.16	34.34	102.91	7.11	0.35
	Minimum	21.54	48.16	31.41	72.00	5.05	-1.39
	Maximum	27.49	54.25	35.18	145.40	10.12	2.14
12/1-12/31	Mean	21.69	51.25	33.70	115.70	8.36	0.28
	Minimum	16.11	47.08	30.64	83.90	6.09	-1.22
	Maximum	24.13	54.43	36.06	156.70	11.68	2.04
1998							
1/1-1/31	Mean	21.96	51.02	33.54	127.14	9.15	0.37
	Minimum	17.10	47.29	30.81	88.10	6.64	-1.43
	Maximum	24.58	54.22	35.84	163.40	11.98	2.42

(Continued)

[1] Dissolved oxygen quantities are presented "as is" with no QA/QC other than eliminating negative values.
[2] Mean values are averages for all appropriate data during the time period.
[3] Minimum (maximum) value is the minimum (maximum) value for the quantity during the time period.

Table 23 (Concluded)							
Time Period	Data Range	Temperature °C	Specific Conductivity mS/cm	Salinity ppt	Dissolved Oxygen %	Dissolved Oxygen mg/l	Water Surface Elevation NGVD 1929 ft
2/1-2/28	Mean	21.00	49.97	32.77	109.58	8.06	0.54
	Minimum	16.03	45.01	29.15	91.50	6.73	-1.17
	Maximum	24.99	53.35	35.24	162.90	11.60	2.51
3/1-3/31	Mean	22.00	50.11	32.87	124.19	8.97	0.43
	Minimum	18.25	44.66	28.87	88.00	6.15	-1.22
	Maximum	25.48	53.33	35.20	170.90	12.18	2.18
4/1-4/30	Mean	24.57	53.73	35.49	106.40	7.24	0.26
	Minimum	20.76	49.48	32.36	79.10	5.30	-1.35
	Maximum	26.69	55.47	36.75	154.50	10.55	1.89
5/1-5/31	Mean	27.63	54.41	35.91	112.11	7.23	0.38
	Minimum	24.84	52.16	34.28	79.00	5.07	-1.04
	Maximum	29.63	55.39	36.64	151.40	9.80	2.14
6/1-6/29	Mean	30.74	54.12	35.60	113.40	6.96	0.35
	Minimum	27.99	49.82	32.46	66.20	4.08	-1.29
	Maximum	33.09	55.48	36.62	148.30	8.98	2.29

Table 24
Biscayne Bay, Station 10 (CTD10), Data Summary

Time Period	Data Range	Temperature °C	Specific Conductivity mS/cm	Salinity ppt	Dissolved Oxygen[1] %	Dissolved Oxygen[1] mg/l	Water Depth Above Instrument** ft
				1997			
12/15-12/31	Mean[2]	21.86	45.61	29.60	98.49	7.26	4.64
	Minimum[3]	19.14	27.37	16.81	66.00	5.08	2.91
	Maximum[3]	24.62	53.35	35.23	120.40	8.83	6.25
				1998			
01/01-01/31	Mean	22.13	46.14	30.18	105.95	7.75	4.78
	Minimum	18.44	28.57	17.65	78.60	6.05	2.76
	Maximum	24.82	53.52	35.40	124.20	8.91	6.56
2/1-2/28	Mean	21.42	44.14	28.56	103.29	7.72	4.64
	Minimum	18.40	26.67	16.36	72.20	5.34	2.82
	Maximum	24.95	52.93	34.95	132.20	9.51	6.63
3/1-3/31	Mean	22.36	42.90	27.66	108.19	8.00	4.54
	Minimum	19.93	24.46	14.86	76.50	5.96	2.69
	Maximum	25.53	52.04	34.29	139.40	10.42	6.30
4/1-4/30	Mean	24.96	45.34	29.37	100.95	7.06	4.45
	Minimum	21.74	26.80	16.39	23.00	1.62	2.68
	Maximum	27.20	53.34	35.19	209.50	14.17	6.07
5/1-5/31	Mean	27.85	49.11	32.02	141.67	9.33	4.62
	Minimum	25.03	31.04	19.24	63.40	4.10	3.05
	Maximum	30.21	53.80	35.44	244.90	16.14	6.32
6/1-6/25	Mean	31.02	**	**	79.29	4.95	4.52
	Minimum	27.91	**	**	1.50	0.90	2.78
	Maximum	33.56	**	**	123.90	7.60	6.38

[1] Dissolved oxygen quantities are presented "as is" with no QA/QC other than eliminating negative values.
[2] Mean values are averages for all appropriate data during the time period.
[3] Minimum (maximum) value is the minimum (maximum) value for the quantity during the time period.
* Data questionable.
** No datum available. Site not surveyed for vertical.

Table 25
Biscayne Bay, Station 11 (CTD11), Data Summary

Time Period	Data Range	Temperature °C	Specific Conductivity mS/cm	Salinity ppt	Dissolved Oxygen[1] %	Dissolved Oxygen[1] mg/l	Water Surface Elevation NGVD 1929 ft
1997							
7/15-7/26	Mean[2]	30.69	45.45	29.26	90.81	5.77	*
	Minimum[3]	29.83	42.96	27.46	58.60	3.77	*
	Maximum[3]	31.80	47.99	31.10	137.60	8.66	*
8/1-8/31	Mean	30.66	46.43	29.97	91.64	5.80	0.69
	Minimum	28.26	38.02	23.97	51.90	3.29	-0.97
	Maximum	32.75	49.63	31.90	152.60	9.46	2.69
9/1-9/30	Mean	28.66	41.96	26.83	89.84	5.98	0.99
	Minimum	26.11	37.10	23.39	55.20	3.62	-.70
	Maximum	30.23	47.92	31.09	137.20	9.11	2.68
10/1-10/31	Mean	26.54	42.80	27.49	100.41	6.91	0.92
	Minimum	24.33	35.24	22.11	62.30	4.19	-0.71
	Maximum	29.49	49.93	32.65	140.10	9.43	3.00
11/1-11/30	Mean	23.92	48.10	31.37	101.78	7.17	0.51
	Minimum	21.83	45.25	29.30	79.10	5.52	-1.31
	Maximum	27.02	51.50	33.86	141.90	10.20	2.48
12/1-12/3	Mean	23.27	47.75	31.12	106.27	7.58	0.16
	Minimum	22.28	46.36	30.10	91.90	6.56	-1.21
	Maximum	23.95	49.23	32.19	122.20	8.76	1.60
1998							
1/27-1/31	Mean	20.60	48.34	31.58	103.82	7.75	0.86
	Minimum	19.32	45.87	29.77	86.10	6.41	-0.81
	Maximum	21.94	51.46	33.86	135.60	10.16	2.69
2/1-2/28	Mean	21.10	45.92	29.81	102.25	7.64	0.75
	Minimum	16.85	42.15	27.10	85.30	6.45	-1.06
	Maximum	24.74	51.03	33.55	135.10	9.80	2.83

(Continued)

*No Data available.
[1] Dissolved oxygen quantities are presented "as is" with no QA/QC other than eliminating negative values.
[2] Mean values are averages for all appropriate data during the time period.
[3] Minimum (maximum) value is the minimum (maximum) value for the quantity during the time period.

Table 25 (Concluded)

Time Period	Data Range	Temperature °C	Specific Conductivity mS/cm	Salinity ppt	Dissolved Oxygen %	Dissolved Oxygen mg/l	Water Surface Elevation NGVD 1929 ft
3/1-3/31	Mean	22.13	45.27	29.34	103.92	7.64	0.60
	Minimum	18.72	40.11	25.61	75.50	5.58	-1.27
	Maximum	25.94	50.55	33.19	141.20	10.26	2.36
4/1-4/30	Mean	24.81	47.26	30.74	104.75	7.29	0.38
	Minimum	21.35	40.02	25.54	78.30	5.47	-1.27
	Maximum	26.85	51.93	34.16	142.60	9.79	2.08
5/1-5/31	Mean	27.83	50.25	32.84	96.05	6.30	0.61
	Minimum	25.10	47.96	31.15	0.40	0.00	-1.04
	Maximum	29.86	52.22	34.28	148.30	9.58	2.23
6/1-6/30	Mean	30.76	**	**	83.48	0.31	0.47
	Minimum	27.99	**	**	0.40	0.00	-1.26
	Maximum	32.82	**	**	547.00	34.64	2.30

** Data questionable.

Table 26
Biscayne Bay, Station 12 (CTD12), Data Summary

Time Period	Data Range	Temperature °C	Specific Conductivity mS/cm	Salinity ppt	Dissolved Oxygen[1] %	Dissolved Oxygen[1] mg/l	Water Surface Elevation NGVD 1929 ft
			1997				
6/18-6/30	Mean[2]	29.56	50.49	32.97	107.40	6.82	0.82
	Minimum[3]	28.34	44.76	28.79	89.70	5.72	-.50
	Maximum[3]	30.88	52.97	34.82	134.10	8.43	2.38
7/1-7/31	Mean	30.09	51.68	33.82	120.15	7.52	0.82
	Minimum	28.80	44.36	28.48	2.50	0.15	-0.58
	Maximum	31.45	54.03	35.54	263.20	16.33	2.34
8/1-8/31	Mean	30.58	51.86	34.04	92.63	6.26	0.85
	Minimum	29.06	45.31	29.24	0.00	1.73	-0.56
	Maximum	32.14	54.91	36.16	197.40	12.32	2.60
9/1-9/30	Mean	29.30	50.22	32.91	80.63	5.63	0.99
	Minimum	27.91	42.05	26.89	0.00	0.02	-0.63
	Maximum	30.57	53.49	35.20	139.70	8.75	2.57
10/1-10/31	Mean	26.86	50.75	33.24	63.89	4.23	0.90
	Minimum	25.06	44.01	28.36	12.90	0.84	-0.53
	Maximum	29.12	54.16	35.75	117.80	7.76	2.82
11/1-11/30	Mean	24.53	51.77	34.04	97.04	6.66	0.66
	Minimum	22.73	45.47	29.43	58.70	4.11	-0.97
	Maximum	26.94	54.36	35.98	116.10	8.09	2.56
12/1-12/31	Mean	22.73	50.52	33.16	97.27	6.92	0.52
	Minimum	19.04	42.30	27.20	66.30	4.87	-1.04
	Maximum	25.04	54.02	35.75	118.00	8.32	2.30
			1998				
1/1-1/31	Mean	22.30	49.71	32.57	112.32	8.08	0.57
	Minimum	18.90	44.44	28.73	91.60	6.54	-1.25
	Maximum	24.66	53.87	35.66	133.40	9.62	2.74

(Continued)

[1] Dissolved oxygen quantities are presented "as is" with no QA/QC other than eliminating negative values.
[2] Mean values are averages for all appropriate data during the time period.
[3] Minimum (maximum) value is the minimum (maximum) value for the quantity during the time period.

Table 26 (Concluded)							
Time Period	Data Range	Temperature °C	Specific Conductivity mS/cm	Salinity ppt	Dissolved Oxygen %	Dissolved Oxygen mg/l	Water Surface Elevation NGVD 1929 ft
2/1-2/28	Mean[1]	21.74	50.13	32.89	98.55	7.15	0.94
	Minimum[2]	18.82	41.09	26.35	18.50	1.32	-0.81
	Maximum[2]	24.60	53.82	35.64	137.50	10.12	2.87
3/1-3/31	Mean	22.41	50.15	32.89	109.84	7.87	0.77
	Minimum	19.72	41.60	26.67	73.90	5.45	-0.88
	Maximum	25.50	53.40	35.26	139.20	10.06	2.48
4/1-4/30	Mean	24.76	49.64	32.48	101.10	6.98	0.60
	Minimum	21.98	42.23	27.08	6.20	.42	-0.91
	Maximum	26.89	54.39	36.00	137.20	9.66	2.12
5/1-5/31	Mean	27.14	52.08	34.21	100.56	6.59	0.71
	Minimum	24.82	47.44	30.80	19.20	1.25	-0.63
	Maximum	29.58	54.32	35.94	129.50	8.36	2.43
6/1-6/25	Mean	30.31	*	*	100.66	6.69	0.81
	Minimum	27.18	*	*	46.60	3.05	-0.75
	Maximum	33.08	*	*	132.70	8.91	2.93

* Data questionable.

Table 27
Julian Day and Hour/ Calendar Day and Hour Comparison

0100[1]	Jul Day[2]	Cal Day[3]	2400[4]	0100	Jul Day	Cal Day	2400
3625	152	6/01	3648	4778	200	7/19	4800
3649	153	6/02	3672	4801	201	7/20	4824
3673	154	6/03	3696	4825	202	7/21	4848
3697	155	6/04	3720	4849	203	7/22	4872
3721	156	6/05	3744	4873	204	7/23	4896
3745	157	6/06	3468	4897	205	7/24	4920
3769	158	6/07	3792	4921	206	7/25	4944
3793	159	6/08	3816	4945	207	7/26	4968
3817	160	6/09	3840	4969	208	7/27	4992
3841	161	6/10	3864	4993	209	7/28	5016
3865	162	6/11	3888	5017	210	7/29	5040
3889	163	6/12	3912	5041	211	7/30	5064
3913	164	6/13	3936	5065	212	7/31	5088
3937	165	6/14	3960	5089	213	8/.01	5112
3961	166	6/15	3984	5113	214	8/02	5136
3985	167	6/16	4008	5137	215	8/03	5160
4009	168	6/17	4032	5161	216	8/04	5184
4033	169	6/18	4056	5185	217	8/05	5208
4057	170	6/19	4080	5209	218	8/06	5232
4081	171	6/20	4104	5233	219	8/07	5256
4105	172	6/21	4128	5257	220	8/08	5280
4129	173	6/22	4152	5281	221	8/09	5304
4153	174	6/23	4176	5305	222	8/10	5328
4177	175	6/24	4200	5329	223	8/11	5352
4201	176	6/25	4224	5353	224	8/12	5376
4225	177	6/26	4248	5377	225	8/13	5400
4249	178	6/27	4272	5401	226	8/14	5424
4273	179	6/28	4296	5425	227	8/15	5448
4297	180	6/29	4320	5449	228	8/16	5472
4321	181	6/30	4344	5473	229	8/17	5496
4345	182	7/01	4368	5497	230	8/18	5520
4369	183	7/02	4392	5521	231	8/19	5544
4393	184	7/03	4416	5545	232	8/20	5568
4417	185	7/04	4440	5569	233	8/21	5592
4441	186	7/05	4464	5593	234	8/22	5616
4465	187	7/06	4488	5617	235	8/23	5640
4489	188	7/07	4512	5641	236	8/24	5664
4513	189	7/08	4536	5665	237	8/25	5688
4537	190	7/09	4560	5689	238	8/26	5712
4561	191	7/10	4584	5713	239	8/27	5736
4585	192	7/11	4608	5737	240	8/28	5760
4609	193	7/12	4632	5761	241	8/29	5784
4633	194	7/13	4656	5785	242	8/30	5808
4657	195	7/14	4680	5809	243	8/31	5832
4681	196	7/15	4704	5833	244	9/01	5856
4705	197	7/16	4728	5857	245	9/02	5880
4729	198	7/17	4752	5881	246	9/03	5904
4753	199	7/18	4776	5905	247	9/04	5928

(Sheet 1 of 5)

[1]Julian hour for calendar day's 0100 hour.
[2]Julian day.
[3]Calendar day (month/day).
[4]Julian hour for calendar day's 2400 hour.

Table 27 (Continued)

0100	Jul Day	Cal Day	2400	0100	Jul Day	Cal Day	2400
5929	248	9/05	5952	7081	296	10/23	7104
5953	249	9/06	5976	7105	297	10/24	7128
5977	250	9/07	6000	7129	298	10/25	7152
6001	251	9/08	6024	7153	299	10/26	7176
6025	252	9/09	6048	7177	300	10/27	7200
6049	253	9/10	6072	7201	301	10/28	7224
6073	254	9/11	6096	7225	302	10/29	7248
6097	255	9/12	6120	7249	303	10/30	7272
6121	256	9/13	6144	7273	304	10/31	7296
6145	257	9/14	6168	7297	305	11/01	7320
6169	258	9/15	6192	7321	306	11/02	7344
6193	259	9/16	6216	7345	307	11/03	7368
6217	260	9/17	6240	7369	308	11/04	7392
6241	261	9/18	6264	7393	309	11/05	7416
6265	262	9/19	6288	7417	310	11/06	7440
6289	263	9/20	6312	7441	311	11/07	7464
6313	264	9/21	6336	7465	312	11/08	7488
6337	265	9/22	6360	7489	313	11/09	7512
6361	266	9/23	6384	7513	314	11/10	7536
6385	267	9/24	6408	7537	315	11/11	7560
6409	268	9/25	6432	7561	316	11/12	7584
6433	269	9/26	6456	7585	317	11/13	7608
6457	270	9/27	6480	7609	318	11/14	7632
6481	271	9/28	6504	7633	319	11/15	7656
6505	272	9/29	6528	7657	320	11/16	7680
6529	273	9/30	6552	7681	321	11/17	7704
6553	274	10/01	6576	7705	322	11/18	7728
6577	275	10/02	6600	7729	323	11/19	7752
6601	276	10/03	6624	7753	324	11/20	7776
6625	277	10/04	6648	7777	325	11/21	7800
6649	278	10/05	6672	7801	326	11/22	7824
6673	279	10/06	6696	7825	327	11/23	7848
6697	280	10/07	6720	7849	328	11/24	7872
6721	281	10/08	6744	7873	329	11/25	7896
6745	282	10/09	6768	7897	330	11/26	7920
6769	283	10/10	6792	7921	331	11/27	7944
6793	284	10/11	6816	7945	332	11/28	7968
6817	285	10/12	6840	7969	333	11/29	7992
6841	286	10/13	6864	7993	334	11/30	8016
6865	287	10/14	6888	8017	335	12/01	8040
6889	288	10/15	6912	8041	336	12/02	8064
6913	289	10/16	6936	8065	337	12/03	8088
6937	290	10/17	6960	8089	338	12/04	8112
6961	291	10/18	6984	8113	339	12/05	8136
6985	292	10/19	7008	8137	340	12/06	8160
7009	293	10/20	7032	8161	341	12/07	8184
7033	294	10/21	7056	8185	342	12/08	8208
7057	295	10/22	7080	8209	343	12/09	8232

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Table 27 (Continued)

0100	Jul Day	Cal Day	2400	0100	Jul Day	Cal Day	2400
8233	344	12/10	8256	9385	392	1/27	9408
8257	345	12/11	8280	9409	393	1/28	9432
8281	346	12/12	8304	9433	394	1/29	9456
8305	347	12/13	8328	9457	395	1/30	9480
8329	348	12/14	8352	9481	396	1/31	9504
8353	349	12/15	8376	9505	397	2/01	9528
8377	350	12/16	8400	9529	398	2/02	9552
8401	351	12/17	8424	9553	399	2/03	9576
8425	352	12/18	8448	9577	400	2/04	9600
8449	353	12/19	8472	9601	401	2/05	9624
8473	354	12/20	8496	9625	402	2/06	9648
8497	355	12/21	8520	9649	403	2/07	9672
8521	356	12/22	8544	9673	404	2/08	9696
8545	357	12/23	8568	9697	405	2/09	9720
8569	358	12/24	8592	9721	406	2/10	9744
8593	359	12/25	8616	9745	407	2/11	9768
8617	360	12/26	8640	9769	408	2/12	9792
8641	361	12/27	8664	9793	409	2/13	9816
8665	362	12/28	8688	9817	410	2/14	9840
8689	363	12/29	8712	9841	411	2/15	9864
8713	364	12/30	8736	9865	412	2/16	9888
8737	365	12/31	8760	9889	413	2/17	9912
8761	366	1/01	8784	9913	414	2/18	9936
8785	367	1/02	8808	9937	415	2/19	9960
8809	368	1/03	8832	9961	416	2/20	9984
8833	369	1/04	8856	9985	417	2/21	10008
8857	370	1/05	8880	10009	418	2/22	10032
8881	371	1/06	8904	10033	419	2/23	10056
8905	372	1/07	8928	10057	420	2/24	10080
8929	373	1/08	8952	10081	421	2/25	10104
8953	374	1/09	8976	10105	422	2/26	10125
8977	375	1/10	9000	10129	423	2/27	10152
9001	376	1/11	9024	10153	424	2/28	10176
9025	377	1/12	9048	10177	425	3/01	10200
9049	378	1/13	9072	10201	426	3/02	10224
9073	379	1/14	9096	10225	427	3/03	10248
9097	380	1/15	9120	10249	428	3/04	10272
9121	381	1/16	9144	10273	429	3/05	10296
9145	382	1/17	9168	10297	430	3/06	10320
9169	383	1/18	9192	10321	431	3/07	10344
9193	384	1/19	9216	10345	432	3/08	10368
9217	385	1/20	9240	10369	433	3/9	10392
9241	386	1/21	9264	10393	434	3/10	10416
9265	387	1/22	9288	10417	435	3/11	10440
9289	388	1/23	9312	10441	436	3/12	10464
9313	389	1/24	9336	10465	437	3/13	10488
9337	390	1/25	9360	10489	438	3/14	10512
9361	391	1/26	9384	10513	439	3/15	10536

(Sheet 3 of 5)

Table 27 (Continued)

0100	Jul Day	Cal Day	2400	0100	Jul Day	Cal Day	2400
10537	440	3/16	10560	11689	488	5/03	11712
10561	441	3/17	10584	11713	489	5/04	11736
10585	442	3/18	10608	11737	490	5/05	11760
10609	443	3/19	10632	11761	491	5/06	11784
10633	444	3/20	10656	11785	492	5/07	11808
10657	445	3/21	10680	11809	493	5/08	11832
10681	446	3/22	10704	11833	494	5/09	11856
10705	447	3/23	10728	11857	495	5/10	11880
10729	448	3/24	10752	11881	496	5/11	11904
10753	449	3/25	10776	11905	497	5/12	11928
10777	450	3/26	10800	11929	498	5/13	11952
10801	451	3/27	10824	11953	499	5/14	11976
10825	452	3/28	10848	11977	500	5/15	12000
10849	453	3/29	10872	12001	501	5/16	12024
10873	454	3/30	10896	12025	502	5/17	12048
10897	455	3/31	10920	12049	503	5/18	12072
10921	456	4/01	10944	12073	504	5/19	12096
10945	457	4/02	10968	12097	505	5/20	12120
10969	458	4/03	10992	12121	506	5/21	12144
10993	459	4/04	11016	12145	507	5/22	12168
11017	460	4/05	11040	12169	508	5/23	12192
11041	461	4/06	11064	12193	509	5/24	12216
11065	462	4/07	11088	12217	510	5/25	12240
11089	463	4/08	11112	42241	511	5/26	12264
11113	464	4/09	11136	12265	512	5/27	12288
11137	465	4/10	11160	12289	513	5/28	12312
11161	466	4/11	11184	12313	514	5/29	12336
11185	467	4/12	11208	12337	515	5/30	12360
11209	468	4/13	11232	12361	516	5/31	12384
11233	469	4/14	11256	12385	517	6/01	12408
11257	470	4/15	11280	12409	518	6/02	12432
11281	471	4/16	11304	12433	519	6/03	12456
11305	472	4/17	11328	12457	520	6/04	12480
11329	473	4/18	11352	12481	521	6/05	12504
11353	474	4/19	11376	12505	522	6/06	12528
11377	475	4/20	11400	12529	523	6/07	12552
11401	476	4/21	11424	12553	524	6/08	12576
11425	477	4/22	11448	12577	525	6/09	12600
11449	478	4/23	11472	12601	526	6/10	12624
11473	479	4/24	11496	12625	527	6/11	12648
11497	480	4/25	11520	12649	528	6/12	12672
11521	481	4/26	11544	12673	529	6/13	12696
11545	482	4/27	11568	12697	530	6/14	12720
11569	483	4/28	11592	12721	531	6/15	12744
11593	484	4/29	11616	12745	532	6/16	12768
11617	485	4/30	11640	12769	533	6/17	12792
11641	486	5/01	11664	12793	534	6/18	12816
11665	487	5/02	11688	12817	535	6/19	12840

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Table 27 (Concluded)

0100	Jul Day	Cal Day	2400	0100	Jul Day	Cal Day	2400
12841	536	6/20	12864				
12865	537	6/21	12888				
12889	538	6/22	12912				
12913	539	6/23	12936				
12937	540	6/24	12960				
12961	541	6/25	12984				
12985	542	6/26	13008				
13009	543	6/27	13032				
13033	544	6/28	13056				
13057	545	6/29	13080				
13081	546	6/30	13104				

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Table 28
Biscayne Bay Discharges - ADCP Intensive Survey 1, 14-16 October 1997

Date	Time est	Transect No.	Total Area sq ft	Resultant Velocity Magnitude ft/sec	Resultant Velocity Direction deg	Discharge cu ft/sec
10/14/97	0822	1[1]	183,363	0.30	180	+55,087
	0922		115,117	0.25	167	+28,332
	1023		180,671	0.09	139	+16,811
	1115*		178,806	0.02	111	-/+3,919[1]
	1208		179,534	0.10	97	-18,162
	1303		173,469	0.24	74	-41,592
	1400		172,431	0.22	83	-37,438
	1455		168,768	0.13	97	-21,449
	1550		170,631	0.12	96	-20,133
	0816	2[2]	8,708	0.66	289	+5,714
	0912		8,787	1.05	103	-9,203
	1004		8,539	1.72	106	-14,653
	1057		9,046	1.74	108	-15,701
	1203		8,203	1.87	105	-15,349
	1302		8,060	1.77	107	-14,254
	1401		8,134	1.41	107	-11,490
	1500		8,281	0.78	103	-6,457
	1601		8,470	0.74	290	+6,240
	0855	3[2]	9,239	0.64	129	-5,919
	0932		9,275	1.46	128	-13,587
	1027		9,273	1.89	127	-17,559
	1121		9,221	2.02	128	-18,590
	1226		8,994	1.92	128	-17,229
	1329		9,338	1.69	128	-15,753
	1424		8,829	1.37	128	-12,113
	1523		8,665	0.38	134	-3,330
	1623		8,889	1.22	294	+10,838
	0841	4[2]	3,661	0.30	137	-1,084
	0922		3,725	1.20	145	-4,475
	1016		3,261	1.91	150	-6,236

(Sheet 1 of 9)

* Transect 1 at 1115 was nearly parallel to the flow, making the sign of the flow questionable, especially at low values.

Table 28 (Continued)

Date	Time est	Transect No.	Total Area sq ft	Resultant Velocity Magnitude ft/sec	Resultant Velocity Direction deg	Discharge cu ft/sec
10/14/97	1110	4[2]	2,969	2.19	155	-6,508
	1215		2,512	2.58	155	-6,482
	1316		2,547	2.16	152	-5,497
	1413		2,619	1.37	147	-3,577
	1514		2,859	0.27	148	-762
	1612		4,419	0.97	326	+4,280
	0844	5[1]	4,370	0.51	65	-2,231
	0930		4,030	1.18	64	-4,764
	1016		4,047	1.50	61	-6,086
	1105		4,115	1.61	65	-6,641
	1159		3,745	1.71	62	-6,391
	1300		3,837	1.55	61	-5,956
	1358		3,980	1.06	60	-4,210
	1502		3,897	0.26	60	-1,015
	1600		4,207	0.97	245	+4,101
	0858	6[2]	23,191	1.22	159	-28,195
	0942		22,731	1.56	154	-35,514
	1026		22,024	1.65	151	-36,324
	1115		21,688	1.59	158	-34,492
	1225		19,520	1.50	161	-29,193
	1309		19,737	1.29	164	-25,496
	1409		17,709	0.88	166	-15,610
	1514		17,358	0.56	343	+9,739
	1615		17,752	1.66	351	+29,497
	0922	7[3]	7,007	2.31	168	-16,221
	1006		6,900	2.47	171	-17,038
	1055		6,971	2.32	167	-16,174
	1143		6,367	2.49	170	-15,871
	1249		6,022	2.16	170	-12,990
	1333		5,994	2.21	169	-13,226
	1430		5,846	1.25	176	-7,296

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Table 28 (Continued)

Date	Time est	Transect No.	Total Area sq ft	Resultant Velocity Magnitude ft/sec	Resultant Velocity Direction deg	Discharge cu ft/sec
10/14/97	1534	7[3]	6,234	1.66	358	+10,330
	1633		6,188	2.79	355	+17,288
10/15/97	0750	8[4]	224,084	0.33	239	+73,211
	0853		210,288	0.27	141	-55,876
	0950		193,083	0.55	119	-106,547
	1045		181,643	0.76	93	-138,730
	1148		166,888	0.82	98	-136,820
	1254		163,069	0.69	95	-113,042
	1355		174,080	0.49	90	-85,327
	1455		171,578	0.09	263	+15,014
	1555		181,709	0.55	254	+100,541
	0829	10[1]	43,881	0.14	214	+6,093
	0949		42,543	1.18	48	-50,371
	1115		44,052	1.41	50	-62,305
	1159		40,985	1.59	51	-65,371
	1259		37,842	1.45	52	-54,954
	1359		37,758	1.03	51	-38,822
	1508		37,156	0.32	230	+11,837
	1602		39,190	1.24	228	+48,655
	1653		39,500	1.60	230	+63,025
	0914	11[3]	41,077	0.20	155	-8,053
	1012		38,464	0.20	36	+7,749
	1129		37,127	0.96	355	+35,741
	1223		34,680	1.14	350	+39,515
	1326		33,424	1.10	349	+36,610
	1422		32,406	0.90	345	+29,320
	1529		33,265	0.06	279	+2,132
	1625		37,680	0.59	176	-22,379
	1712		37,803	0.83	179	-31,224
	0846	12[2]	18,928	0.45	143	-8,599
	1111		16,807	1.34	154	-22,559

(Sheet 3 of 9)

Table 28 (Continued)						
Date	**Time est**	**Transect No.**	**Total Area sq ft**	**Resultant Velocity Magnitude ft/sec**	**Resultant Velocity Direction deg**	**Discharge cu ft/sec**
10/15/97	1208	12[2]	16,094	1.32	155	-21,248
	1301		15,273	1.04	155	-15,820
	1403		15,109	0.53	151	-8,051
	1457		15,777	0.50	341	+7,909
	1556		16,734	1.09	333	+18,189
	1659		17,793	1.60	331	+28,426
	0944	112[2]	18,566	1.12	152	-20,846
	1030		17,491	1.29	153	-22,606
	0902	13[4]	26,350	0.14	106	-3,645
	0959		26,131	0.71	96	-18,427
	1044		27,151	1.02	99	-27,720
	1140		26,991	1.35	105	-36,441
	1224		26,142	1.39	101	-36,343
	1314		26,609	1.13	101	-30,004
	1416		26,387	0.73	93	-19,186
	1510		26,696	0.06	55	-1,726
	1610		27,987	0.80	274	+22,401
	1715		27,671	0.82	256	+22,803
	0929	14[2]	28,889	0.67	124	-19,347
	1009		28,690	1.02	126	-29,306
	1051		29,182	1.19	127	-34,663
	1148		28,164	1.40	127	-39,465
	1231		28,604	1.34	127	-38,441
	1322		27,234	1.20	124	-32,720
	1422		27,975	0.67	125	-18,843
	1517		27,528	0.14	348	+3,847
	1616		28,148	1.03	314	+28,952
	1723		28,030	1.56	310	+43,845
	0910	114[2]	47,645	0.34	124	-16,311
	0934	15[2]	8,504	0.70	164	-5,928
	1012		9,018	0.74	149	-6,716

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Table 28 (Continued)						
Date	**Time est**	**Transect No.**	**Total Area sq ft**	**Resultant Velocity Magnitude ft/sec**	**Resultant Velocity Direction deg**	**Discharge cu ft/sec**
10/15/97	1055	15[2]	8,842	0.74	161	-6,532
	1151		8,335	0.88	155	-7,359
	1237		8,653	0.66	163	-5,686
	1328		7,997	0.54	161	-4,292
	1426		8,310	0.12	128	-1,022
	1520		7,256	0.52	344	+3,769
	1619		8,554	0.87	344	+7,485
	1727		8,204	1.29	332	+10,606
	0916	16[2]	11,626	1.45	173	-16,814
	1017		11,348	1.76	171	-19,966
	1059		10,684	1.92	171	-20,499
	1155		10,147	1.96	173	-19,867
	1240		10,122	1.78	170	-17,976
	1331		10,492	1.26	173	-13,176
	1429		9,981	0.37	156	-3,699
	1524		10,623	1.11	7	+11,782
	1622		11,613	1.38	24	+16,020
	1731		12,574	1.16	29	+14,633
10/16/97	0811	17[4]	2,607	0.38	282	+980
	0906		2,679	0.13	258	+335
	1002		2,570	0.38	117	-978
	1100		2,392	0.79	99	-1,892
	1203		2,218	0.72	106	-1,593
	1304		2,301	0.89	111	-2,046
	1405		2,220	0.80	96	-1,778
	1504		2,092	0.49	117	-1,022
	1600		2,113	0.05	273	+100
	1659		2,232	0.79	274	+1,756
	0850	18[5]	6,482	0.33	189	+2,122
	0938		6,455	0.21	188	+1,357
	1008		6,243	0.20	192	+1,251

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Table 28 (Continued)

Date	Time est	Transect No.	Total Area sq ft	Resultant Velocity Magnitude ft/sec	Resultant Velocity Direction deg	Discharge cu ft/sec
10/16/97	1107	18[5]	5,695	0.06	331	-363
	1210		5,147	0.40	3	-2,065
	1311		4,763	0.62	357	-2,970
	1411		4,272	0.72	355	-3,062
	1510		4,268	0.49	354	-2,086
	1606		4,425	0.20	344	-867
	1704		5,018	0.14	198	+698
	0820	19[4]	12,916	0.18	207	+2,357
	0912		13,152	0.19	237	+2,476
	1017		13,290	0.14	150	-1,859
	1118		13,051	0.15	148	-1,954
	1223		12,431	0.35	74	-4,412
	1321		11,695	0.37	77	-4,315
	1421		11,414	0.31	77	-3,550
	1519		11,160	0.23	83	-2,593
	1616		11,546	0.09	222	+1,039
	1713		11,767	0.29	240	+3,423
	0830	20[1]	15,122	0.55	184	+8,322
	0923		14,694	0.69	185	+10,144
	1030		14,891	0.69	180	+10,205
	1129		13,432	0.39	180	+5,177
	1233		12,848	0.31	11	-4,042
	1331		12,455	0.70	19	-8,766
	1433		12,174	0.80	18	-9,769
	1530		12,160	0.66	18	-8,082
	1625		13,134	0.49	19	-6,465
	1722		13,299	0.01	145	-64
	0813	21[3]	8,441	0.51	4	+4,299
	0907		8,788	0.31	13	+2,706
	0957		8,588	0.01	82	+51
	1059		8,183	0.49	201	-4,014

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Table 28 (Continued)						
Date	Time est	Transect No.	Total Area sq ft	Resultant Velocity Magnitude ft/sec	Resultant Velocity Direction deg	Discharge cu ft/sec
10/16/97	1205	21[3]	7,689	0.40	201	-3,102
	1306		7,087	0.36	201	-2,545
	1409		6,572	0.31	205	-2,046
	1451		6,468	0.45	183	-2,882
	1545		6,321	0.27	190	-1,734
	1643		6,234	0.01	240	-41
	1733		6,534	0.29	3	+1,891
	1111	121[3]	4,249	0.45	157	-1,897
	1215		4,043	0.29	155	-1,192
	1504		3,255	0.29	166	-945
	1555		3,033	0.36	180	-1,080
	1653		3,500	0.16	13	+549
	0828	22[3]	8,182	0.23	355	+1,843
	0918		8,213	0.24	2	+1,977
	1013		8,075	0.06	26	+470
	1124		7,568	0.20	200	-1,502
	1228		7,078	0.16	211	-1,123
	1321		7,138	0.11	226	-775
	1422		6,568	0.10	215	-673
	1515		5,962	0.15	199	-914
	1607		6,042	0.24	200	-1,430
	1706		6,585	0.06	1	+382
	0838	23[2]	11,265	0.33	316	+3,762
	0925		11,528	0.31	312	+3,543
	1022		11,184	0.08	119	-921
	1137		10,750	0.37	128	-3,947
	1236		10,127	0.40	121	-4,004
	1330		9,520	0.36	118	-3,459
	1429		9,286	0.33	120	-3,051
	1521		8,712	0.41	125	-3,545
	1616		8,599	0.55	130	-4,764

(Sheet 7 of 9)

Table 28 (Continued)

Date	Time est	Transect No.	Total Area sq ft	Resultant Velocity Magnitude ft/sec	Resultant Velocity Direction deg	Discharge cu ft/sec
10/16/97	1714	23[2]	8,977	0.13	316	+1,196
	0853	24[6]	7,395	0.01	90	+62
	0939		6,808	0.08	305	-520
	1039		7,124	0.01	37	+42
	1151		6,422	0.01	88	+89
	1251		6,130	0.01	107	+46
	1357		6,152	0.04	16	+222
	1439		5,592	0.01	51	+55
	1529		5,370	0.04	155	+232
	1626		5,596	0.09	98	+528
	1721		5,653	0.08	91	+427
	0820	25[7]	8,204	0.10	72	+853
	0902		8,209	0.10	76	+851
	1000		8,385	0.28	10	-2,330
	1100		8,044	0.17	30	-1,387
	1204		7,175	0.22	32	-1,610
	1300		7,015	0.26	38	-1,847
	1400		6,394	0.25	28	-1,604
	1503		5,975	0.08	43	-502
	1603		5,926	0.24	197	+1,393
	1658		6,208	0.57	188	+3,522
	0826	26[2]	21,785	0.95	287	+20,765
	0910		22,363	0.19	298	+4,295
	1008		26,539	0.87	130	-23,021
	1110		26,537	1.02	136	-27,070
	1212		26,706	1.06	137	-28,332
	1308		26,314	1.07	142	-28,186
	1405		24,112	0.94	139	-22,748
	1510		20,984	0.61	126	-12,879
	1610		14,888	0.98	301	+14,529
	1706		15,657	1.62	287	+25,367

(Sheet 8 of 9)

Table 28 (Concluded)

Date	Time est	Transect No.	Total Area sq ft	Resultant Velocity Magnitude ft/sec	Resultant Velocity Direction deg	Discharge cu ft/sec
10/16/97	0838	27[8]	26,194	0.41	25	+10,658
	0920		24,499	0.34	26	+8,336
	1019		24,326	0.17	212	-4,064
	1119		23,867	0.38	199	-9,182
	1225		22,849	0.37	196	-8,354
	1319		23,276	0.31	201	-7,250
	1416		22,168	0.23	217	-5,021
	1523		21,112	0.14	236	-3,039
	1619		21,069	0.06	316	+1,186
	1716		21,537	0.22	353	+4,693

(Sheet 9 of 9)

The following footnotes provide direction information for the tabulated discharges. See also, Plates 169 to 195 for discharge plots and Plates 222 to 237 for plan views of the transects.

[1] Flow is to the southwest or to the northeast. Positive values are to the southwest; negative values are to the northeast.
[2] Flow is to the northwest or to the southeast. Positive values are to the northwest; negative values are to the southeast.
[3] Flow is to the north or to the south. Positive values are to the north; negative values are to the south.
[4] Flow is to the west or to the east. Positive values are to the west; negative values are to the east.
[5] Flow is to the south or to the north. Positive values are to the south; negative values are to the north.
[6] Flow is to the east or to the west. Positive values are to the east; negative values are to the west.
[7] Flow is to the southeast or to the northwest. Positive values are to the southeast; negative values are to the northwest.
[8] Flow is to the northeast or to the southwest. Positive values are to the northeast; negative values are to the southwest.

Table 29
Biscayne Bay Discharges - ADCP Intensive Survey 2, 26-28 February 1998

Date	Time est	Transect No.	Total Area sq ft	Resultant Velocity Magnitude ft/sec	Resultant Velocity Direction deg	Discharge cu ft/sec
2/28/98	0815	1[1]	343,371	0.01	167	+2,979
	0923		164,531	0.24	172	+40,143
	1019		165,598	0.39	180	+64,459
	1109		168,110	0.36	177	+60,716
	1205		169,859	0.31	172	+53,226
	1254		170,886	0.15	134	+25,278
	1354		165,406	0.06	127	+10,014
	1456		162,927	0.13	91	-21,924
	1554		159,796	0.17	76	-26,939
	0806	2[2]	8,436	1.78	301	+15,008
	0849		8,617	1.87	300	+16,136
	0955		8,984	1.71	300	+15,370
	1107		8,519	1.14	299	+9,744
	1236		8,027	1.23	116	-9,853
	1322		7,617	1.71	123	-13,012
	1419		7,325	1.82	121	-13,341
	1513		7,488	1.73	116	-12,930
	1602		7,225	1.68	119	-12,155
	0833	3[2]	8,497	2.26	299	+19,237
	0917		8,789	2.38	298	+20,961
	1021		8,548	2.16	298	+18,441
	1129		8,803	0.98	297	+8,624
	1258		9,304	1.46	127	-13,579
	1351		8,491	1.78	127	-15,147
	1444		8,150	1.81	126	-14,727
	1535		7,981	1.75	127	-13,944
	1623		8,147	1.60	126	-13,018
	0818	4[2]	4,404	1.51	338	+6,671
	0904		3,872	1.66	339	+6,445
	1007		3,535	1.69	339	+5,967

(Sheet 1 of 7)

Table 29 (Continued)						
Date	Time est	Transect No.	Total Area sq ft	Resultant Velocity Magnitude ft/sec	Resultant Velocity Direction deg	Discharge cu ft/sec
2/28/98	1119	4[2]	3,066	0.92	337	+2,823
	1248		2,740	1.63	164	-4,471
	1337		2,210	2.48	173	-5,473
	1431		2,309	2.30	172	-5,304
	1525		2,063	2.19	170	-4,515
	1614		2,194	2.05	171	-4,495
	0816	5[1]	3,777	1.54	235	+5,818
	0900		3,789	1.62	237	+6,146
	1002		3,949	1.45	240	+5,707
	1104		3,941	0.93	240	+3,674
	1209		3,587	0.73	56	-2,618
	1302		3,816	1.53	58	-5,829
	1403		3,518	1.58	56	-5,569
	1504		3,398	1.63	55	-5,552
	1601		3,279	1.59	60	-5,219
	0834	6[2]	22,308	1.79	349	+40,025
	0919		20,759	1.93	342	+40,005
	1015		21,785	1.47	345	+32,087
	1118		20,354	0.42	342	+8,609
	1232		19,426	1.48	148	-28,805
	1314		19,018	1.72	148	-32,720
	1412		15,833	1.98	148	-31,347
	1514		14,626	1.91	155	-27,969
	1611		15,141	1.52	159	-23,004
	0822	7[3]	6,242	3.45	349	+21,546
	0907		7,251	2.98	349	+21,574
	1007		6,725	2.74	337	+18,425
	1109		7,223	1.21	330	+8,734
	1215		6,847	2.06	162	-14,078
	1307		6,723	2.31	166	-15,534
	1407		6,268	2.59	164	-16,257

(Sheet 2 of 7)

Table 29 (Continued)

Date	Time est	Transect No.	Total Area sq ft	Resultant Velocity Magnitude ft/sec	Resultant Velocity Direction deg	Discharge cu ft/sec
2/28/98	1509	7[3]	5,875	2.69	165	-15,807
	1605		5,725	2.49	166	-14,241
2/27/98	1029	8[4]	213,061	0.25	155	-54,201
	1132		207,602	0.58	119	-119,949
	1230		179,228	0.80	103	-142,503
	1330		171,509	0.83	103	-143,101
	1433		169,216	0.66	108	-112,481
	1538		165,975	0.40	98	-66,281
	0902	10[1]	38,077	1.36	241	+51,602
	0947		38,072	0.59	243	+22,478
	1055		39,961	1.17	59	-46,836
	1156		39,186	1.41	57	-55,441
	1256		36,468	1.84	59	-67,127
	1346		34,704	1.90	60	-65,916
	1447		34,353	1.57	61	-53,825
	1539		33,819	1.11	61	-37,599
	1632		32,969	0.09	61	-3,131
	0837	11[3]	39,143	0.95	202	-37,355
	0923		40,625	0.75	197	-30,549
	1015		40,158	0.48	195	-19,258
	1115		38,873	0.01	271	+468
	1231		36,684	0.92	6	+33,709
	1320		34,696	1.32	360	+45,786
	1406		33,377	1.29	358	+42,920
	1505		33,079	1.23	356	+40,813
	1559		32,741	0.91	1	+29,851
2/26/98	0812	12[2]	16,644	1.27	324	+21,171
	0924		19,955	0.20	159	-3,933
	1003		18,911	0.75	159	-14,264
	1100		17,632	1.16	142	-20,472
	1215		16,940	1.07	148	-18,090

(Sheet 3 of 7)

Table 29 (Continued)

Date	Time est	Transect No.	Total Area sq ft	Resultant Velocity Magnitude ft/sec	Resultant Velocity Direction deg	Discharge cu ft/sec
2/26/98	1258	12[2]	15,131	0.97	146	-14,617
	0821	13[4]	26,258	0.08	232	+2,220
	0934		26,639	0.07	143	-1,772
	1015		24,549	0.52	85	-12,826
	1116		25,197	1.06	91	-26,666
	1230		25,186	1.32	95	-33,292
	1312		23,830	1.33	90	-31,646
	0825	14[2]	25,384	1.31	295	+33,372
	0939		26,680	0.02	193	-534
	1021		27,792	0.75	118	-20,864
	1121		27,077	1.21	120	-32,700
	1235		26,888	1.40	118	-37,731
	1316		26,564	1.53	110	-40,728
	0827	15[2]	7,557	0.42	306	+3,201
	0941		8,803	0.47	138	-4,123
	1024		9,491	0.75	145	-7,131
	1123		8,970	0.78	145	-6,985
	1238		8,605	0.72	141	-6,232
	1318		8,754	0.75	137	-6,538
	0829	16[2]	10,977	0.87	30	-9,502
	0944		11,531	1.14	165	-13,173
	1026		10,838	1.69	163	-18,298
	1126		10,304	1.94	164	-20,027
	1241		9,836	1.75	161	-17,241
	1320		8,947	1.75	158	-15,665
2/27/98	0831	17[4]	2,521	0.47	256	+1,174
	0921		2,502	0.33	258	+816
	1006		2,620	0.05	172	-133
	1058		2,569	0.58	82	-1,503
	1204		2,341	0.82	82	-1,928
	1305		2,302	0.89	88	-2,039

(Sheet 4 of 7)

Table 29 (Continued)						
Date	**Time est**	**Transect No.**	**Total Area sq ft**	**Resultant Velocity Magnitude ft/sec**	**Resultant Velocity Direction deg**	**Discharge cu ft/sec**
2/27/98	1405	17[4]	2,194	1.17	81	-2,562
	1504		2,313	0.67	89	-1,538
	1631		2,136	0.12	256	+246
	0837	18[5]	6,174	0.52	179	+3,220
	0926		6,171	0.37	180	+2,273
	1011		6,229	0.31	186	+1,938
	1104		5,690	0.14	185	+777
	1209		5,307	0.18	338	-954
	1311		4,758	0.53	342	-2,521
	1411		4,427	0.65	353	-2,867
	1511		4,078	0.66	347	-2,699
	1636		4,332	0.20	357	-886
	0849	19[4]	12,754	0.37	224	+4,741
	0938		13,464	0.22	224	+3,003
	1022		13,356	0.13	212	+1,766
	1115		12,738	0.03	195	+343
	1220		12,201	0.09	354	-1,051
	1325		11,599	0.37	58	-4,286
	1422		11,220	0.38	47	-4,311
	1523		11,235	0.19	31	-2,133
	1652		11,024	0.13	222	+1,469
	0902	20[1]	14,396	0.60	177	+8,587
	0951		15,491	0.51	176	+7,839
	1033		14,114	0.72	174	+10,227
	1126		13,971	0.52	178	+7,311
	1231		13,421	0.10	35	-1,400
	1336		12,478	0.83	8	-10,337
	1433		12,440	0.95	7	-11,878
	1534		11,948	0.85	9	-10,181
	1701		11,922	0.46	8	-5,522
2/26/98	0841	21[3]	8,793	0.34	9	+2,991

(Sheet 5 of 7)

Table 29 (Continued)						
Date	Time est	Transect No.	Total Area sq ft	Resultant Velocity Magnitude ft/sec	Resultant Velocity Direction deg	Discharge cu ft/sec
2/26/98	0929	21[3]	8,785	0.15	10	+1,316
	1023		8,413	0.25	209	-2,063
	1122		7,944	0.25	210	-2,024
	1216		7,573	0.31	183	-2,347
	1312		6,867	0.20	199	-1,391
	1416		6,537	0.16	179	-1,039
	1514		6,424	0.23	193	-1,499
	1610		6,492	0.07	158	-482
	0851	121[3]	4,456	0.20	352	+878
	0938		4,455	0.10	335	+441
	1039		4,549	0.35	161	-1,576
	1132		4,238	0.21	158	-900
	1228		4,124	0.25	170	-1,022
	1334		3,714	0.08	158	-279
	1427		3,552	0.19	179	-672
	1525		3,337	0.17	178	-576
	1620		3,643	0.04	154	-148
	0903	22[3]	6,812	0.13	36	+873
	0949		6,832	0.17	22	+1,189
	1052		6,477	0.17	212	-1,108
	1144		6,444	0.15	222	-980
	1240		6,304	0.13	205	-798
	1346		5,664	0.13	190	-713
	1440		5,460	0.12	186	-631
	1538		5,758	0.21	214	-1,189
	1633		5,515	0.15	212	-810
	0910	23[2]	9,775	0.29	321	+2,842
	0957		9,885	0.14	334	+1,432
	1100		8,966	0.50	146	-4,479
	1152		8,537	0.45	147	-3,868
	1249		8,037	0.52	141	-4,160

(Sheet 6 of 7)

Table 29 (Concluded)

Date	Time est	Transect No.	Total Area sq ft	Resultant Velocity Magnitude ft/sec	Resultant Velocity Direction deg	Discharge cu ft/sec
2/26/98	1353	23[2]	7,434	0.44	135	-3,240
	1450		7,389	0.35	134	-2,579
	1546		7,143	0.55	138	-3,917
	1641		7,410	0.03	94	-219
	0845	25[6]	7,544	0.06	68	+448
	0928		7,432	0.16	43	-1,183
	1029		6,912	0.21	22	-1,419
	1129		6,810	0.15	38	-1,025
	1229		6,196	0.19	37	-1,207
	1330		5,603	0.20	39	-1,125
	1429		5,217	0.12	36	-646
	1528		5,144	0.09	92	+442
	0853	26[2]	12,843	0.74	283	+9,532
	0937		14,343	0.38	144	-18,843
	1038		15,811	1.49	124	-23,575
	1137		13,304	1.81	126	-24,113
	1237		12,787	1.91	127	-24,475
	1339		12,335	1.76	119	-21,769
	1437		11,446	1.37	116	-15,649
	1538		10,388	0.32	326	+3,300
	0903	27[7]	33,441	0.17	3	+5,571
	0951		32,532	0.04	271	-1,383
	1047		31,691	0.21	201	-6,564
	1146		30,856	0.18	188	-5,649
	1247		29,659	0.13	193	-3,801
	1350		28,142	0.09	42	+2,614
	1447		28,430	0.05	274	-1,507
	1553		28,119	0.03	341	+848

(Sheet 7 of 7)

The following footnotes provide direction information for the tabulated discharges. See also, Plates 196 to 221 for discharge plots and Plates 222 to 237 for plan views of the transects.

[1]Flow is to the southwest or to the northeast. Positive values are to the southwest; negative values are to the northeast.
[2]Flow is to the northwest or to the southeast. Positive values are to the northwest; negative values are to the southeast.
[3]Flow is to the north or to the south. Positive values are to the north; negative values are to the south.
[4]Flow is to the west or to the east. Positive values are to the west; negative values are to the east.
[5]Flow is to the south or to the north. Positive values are to the south; negative values are to the north.
[6]Flow is to the southeast or to the northwest. Positive values are to the southeast; negative values are to the northwest.
[7]Flow is to the northeast or to the southwest. Positive values are to the northeast; negative values are to the southwest.

Table 30
Summary of CTD Water Level Data Return for Biscayne Bay

Location	Total Possible Days of Data	Days Data Recorded	Days Data Not Recorded	Suspected Cause	Dates Missed mm/dd (hr)	% of Data Returned
CTD1	390.448	385.802	4.646	Gage malfunction	02/14 (2030) – 02/17 (1245)	98.810
CTD2	382.448	379.802	2.646	Gage malfunction	02/14 (2100) – 02/17 (1230)	99.308
CTD3	390.426	363.478	26.948	Gage malfunction	01/24 (0900) – 02/18 (1330)	93.098
CTD4	390.399	358.399	32.00	Gage malfunction	01/03 (1000) – 10/04 (1015)	
				Gage malfunction	12/08 (1030) – 01/07 (1015)	91.803
CTD5	390.375	354.896	35.479	Gage malfunction	06/10 (0515) – 07/10 (1315)	
				Gage malfunction	03/28 (0945) – 04/01 (1315)	90.911
CTD6	390.375	390.375	0.00	X	x	100.00
CTD7	379.354	295.729	83.625	Data rejected - bad pressures	06/06 (1515) – 07/10 (1215)	
				Gage malfunction	2/02 (1730) – 2/06 (1015)	77.956
				Gage malfunction	03/26 (0130) – 03/26 (1000)	
CTD8	383.00	375.01	7.990	Gage malfunction	03/18 (1215) – 03/26 (1200)	97.914
CTD9	382.00	382.00	0.00	X	x	100.00
CTD10	192.875	192.812	0.063	Gage malfunction	04/21 (0915) – 04/21 (1045)	99.967
CTD11	381.552	308.425	73.127	Gage malfunction	07/15 (1045) – 07/26 (0942)	
				Gage malfunction	07/26 (0942) – 08/01 (1230)	
				Gage malfunction	12/03 (1057) – 01/27 (1215)	80.833
CTD12	372. 595	372.595	0.00	X	x	100.00

Table 31
Summary of CTD Salinity Data Return for Biscayne Bay

Location	Total Possible Days of Data	Days Data Recorded*	Days Data Not Recorded	Suspected Cause	Dates Missed mm/dd (hrs)	% of Data Returned
CTD1	390.448	286.5	103.9	Gage malfunction	12/17/97 (1300)- 04/01/98 (1130)	73
CTD2	382.4	326.5	55.9	Gage malfunction	08/27/97 (1200)- 10/22/97 (1015)	85
CTD3	390.426	366/3	24/2	Gage malfunction	01/24 (0900) – 02/18 (1330)	94
CTD4	390.399	358.399	32.00	Gage malfunction	07/10/97 (1215)-08/15/97 (1200) 10/03/97 (1015)-10/04/97 (1000) 12/08/97(1030)- 01/07/98 (1015) 01/03/98 (1000)- 03/02/98 (1500)	75
CTD5	390.375	294.4	96.03	Gage malfunction	07/10/97 (1215)-08/15/97 (1200) 10/03/97 (1015)-10/04/97 (1000) 12/08/97(1030)- 03/28/98 (0945)- 04/01/98 (1315)	82
CTD6	390.375	336.45	53.93	Gage malfunction	12/05/97 (1200) - 01/29/98 (1015)	86
CTD7	379.354	333.35	46.01	Data rejected - bad pressures	06/06/97 (1515)- 07/10/97 (1215)	88
				Gage malfunction	07/29/97 (1330)-09/10/97 (0945) 02/02/98 (1730)- 2/06/98 (1015) 03/26/98 (0130)– 03/26/98 (1000)	
CTD8	383.00	300.32	82.68	Gage malfunction	08/01/97 (1515) - 08/21/97 (1330) 12/10/97 (1615) - 02/06/98 (1100) 03/18/98 (1215) – 03/26/98 (1200) 05/10/98 (1430) - 05/21/98 (1015)	78
CTD9	380.00	380.00	0.00			100
CTD10	190.875	192.875	0.0			100
CTD11	381.552	322.6	59.0	Gage malfunction	07/06/97 (1000) - 08/01/97 (1230) 12/03/97 (1115) - 01/27/98 (1200)	85
				Data suspect	06/25/98 (1230)	
CTD12	372. 595	345.6	27	Gage malfunction	08/02/97 (1115) - 09/17/97 (1030)	93

* These days include times when fouling may be evident, but when data were, nevertheless, recorded during deployment. Times when the meters were on, but not deployed, are not included.

Table 32
CTD1 Depth Calibration Information

Deployment Number	Unit ID	Deployment Date	Depth Calibration Note	Pre-calibration Reading	Calibration Check Reading	Calibration Reading	Post-deployment Reading	Retrieval Date	Note
1	AA	6-6-97	**	**	**	**	**	**	
2	B*	7-8	**	**	**	**	**	**	
3	N	7-18	**	**	**	**	**	**	1
4	R	8-5	dia, 0.0	0.155	**	0.000	-0.057	8-27-97	
5	O	8-26	dia, 0.0	-0.012	**	0.000	0.020	9-19	2
6	T*	9-19	dia, 0.0	-0.009	**	0.000	-0.003	10-22	
7	C	10-22	dia, 0.0	-0.018	**	0.000	-0.012	11-19	3
8	I	11-19	dia, 0.0	-0.006	**	0.000	-0.039	12-19	4
9	Z	12-17	dia, 0.0	0.004	**	0.000	0.573	2-17-98	5
			DT, 0.5	**	0.499	**	1.097		
10	D	2-17-98	dia, 0.0	-0.017	**	0.000	0.067	4-1	6
			DT, 0.5	**	0.517	**	0.573		
11	Z	4-1	dia, 0.0	0.057	**	0.000	0.383	5-4	
			DT, 0.5	**	0.509	**	0.910		
12	X	5-4	dia, 0.0	-0.006	**	0.000	-0.007	6-1	
			DT, 0.5	**	0.510	**	0.505		
13	A	6-1	Dia,. 0.0	0.021	**	0.000	-0.038	7-9	7
			DT, 0.5	**	0.487	**	0.465		

dia = dry in air
DT = depth test
** = no relevant information
Information taken from BNP calibration sheets.
Columns 4, 5, 6, 7, and 8 are distance in units of meter.

[1]Calibration depth and pressure mentioned on log sheet.
[2]Calibration date in deployment depth column.
[3]Calibrated 10-13-97.
[4]Calibrated 11-10-97; note says "Depth test at 0.504."
[5] "Unit not running during recovery" and "0.573 at 0.000 depth".
[6]Calibrated 2-7-98.
[7]Calibrated 5-28-97; "Power failure raised room temp" for post-deployment check.

Table 33
CTD2 Depth Calibration Information

Deployment Number	Unit ID	Deployment Date	Depth Calibration Note	Pre-calibration Reading	Calibration Check Reading	Calibration Reading	Post-deployment Reading	Retrieval Date	Note
1	AL	6-13-97	**	**	**	**	**	7-8-97	
2	E	7-8-97	**	**	**	**	**	7-18-97	
3	W	7-18-97	**	**	**	**	**	8-5-97	
4	Q	8-5-97	dia, 0.0	0.142	**	0.000	0.024	8-27-97	
5	D	8-26-97	dia, 0.0	-0.013	**	0.000	0.028	9-19-97	1
6	F	9-19-97	dia, 0.0	-0.007	**	0.000	0.024	10-22-97	
7	V	10-22-97	dia, 0.0	0.021	**	0.000	0.007	11-19-97	2
8	P	11-19-97	dia, 0.0	0.000	**	0.000	-0.010	12-17-97	3
			DT, 0.5	**	**	0.502	0.494		
9	A	12-17-97	dia, 0.0	0.008	**	0.000	-0.041	2-17-97	4
			DT, 0.5	**	0.472	**	0.452		
10	Y	2-17-98	dia, 0.0	-0.004	**	0.000	0.057	4-1-98	5
			DT, 0.5	**	0.509	**	0.603		
11	M	4-1-98	dia, 0.0	0.010	**	0.000	-0.038	5-4-98	
			DT, 0.5	**	0.510	**	0.475		
12	C	5-4-98	dia, 0.0	0.005	**	0.000	-0.072	6-1-98	
			DT, 0.5	**	0.469	**	0.441		
13	P	6-1-98	dia, 0.0	0.004	**	0.000	0.000	7-9-98	6
			DT, 0.5	**	0.516	**	0.509		

dia = dry in air
DT = depth test
** = no relevant information
Information taken from BNP calibration sheets.
Columns 4, 5, 6, 7, and 8 are distance in units of meter.

[1]Calibration date in deployment date column.
[2]Calibrated 10-13-97.
[3]Calibrated 11-10-97.
[4]Unit was not running during recovery.
[5]Calibrated 2-7-98.
[6]Power failure caused raise in room temperature for post-deployment check.

Table 34
CTD3 Depth Calibration Information

Deployment Number	Unit ID	Deployment Date	Depth Calibration Note	Pre-calibration Reading	Calibration Check Reading	Calibration Reading	Post-deployment Reading	Retrieval Date	Note
1	AC	6-6-97	**	**	**	**	**	7-2-97	
2	AJ	7-1-97	**	**	**	**	**	7-18-97	1
3	V	7-18-97	**	**	**	**	**	8-5-97	
4	x	x	**	**	**	**	**	x	2
5	M	8-26-97	dia, 0.0	-0.007	**	0.000	0.021	9-19-97	1
6	Y*	9-19-97	dia, 0.0	-0.012	**	0.000	0.017	10-22-97	
7	B*	10-22-97	dia, 0.0	0.004	**	0.000	0.0222	11-19-97	3
8	E	11-19-97	dia, 0.0	0.0	**	0.000	-0.011	12-17-00	
			DT, 0.5	**	**	0.511	0.501		
9	N	12-17-97	dia, 0.0	-0.030	**	0.000	-0.007	2-18-97	4
			DT, 0.5	**	0.507	**	0.524		
10	Z	2-18-97	dia, 0.0	0.181	**	0.000	0.223	3-27-97	5
			DT, 0.5	**	0.510	**	0.732		
11	W	3-27-97	dia, 0.0	0.028	**	0.000	-0.080	4-23-97	
			DT, 0.5	**	0.508	**	0.431		
12	B*	4-23-97	dia, 0.0	-0.008	**	0.000	-0.018	5-4-97	
			DT, 0.5	**	0.507	**	0.492		
13	T*	5-4-97	dia, 0.0	-0.003	**	0.000	-0.028	6-1-97	
			DT, 0.5	**	0.512	**	0.494		
14	R	6-1-97	dia, 0.0	-0.007	**	0.000	-0.004	7-9-97	
			DT, 0.5	**	0.508	**	0.513		

dia = dry in air
DT = depth test
** = no relevant information
Information taken from BNP calibration sheets.
Columns 4, 5, 6, 7, and 8 are distance in units of meter.

[1]Calibration date in deployment date column.
[2]Log sheet missing.
[3]Calibrated 11-10-97.
[4]Data end 1-24-98.
[5]Unit found lying on bottom; float was broken.

Table 35
CTD4 Depth Calibration Information

Deployment Number	Unit ID	Deployment Date	Depth Calibration Note	Pre-calibration Reading	Calibration Check Reading	Calibration Reading	Post-deployment Reading	Retrieval Date	Note
1	AD	6-6-97	**	**	**	**	**	7-10-97	1
2	D	7-10-97	**	**	**	**	**	7-29-97	
3	E	7-29-97	dia, 0.0	0.109	**	0.000	0.017	8-15-97	
4	E	8-15-97	dia, 0.0	0.0	**	0.000	-0.053	9-10-97	
5	V	9-10-97	dia, 0.0	0.115	**	0.000	0.036	10-3-97	
6	Z	10-3-97	dia, 0.0	-0.010	**	0.000	0.042	10-30-97	
7	W	10-29-97	dia, 0.0	0.01	**	0.000	**	12-8-97	2
			DT, 0.5	**	**	0.501	**		
8	X	12-8-97	dia, 0.0	-0.018	**	0.0	0.016	1-7-98	3
			DT, 0.5	**	0.497	**	0.519		
9	P	1-7-98	dia, 0.0	0.003	**	0.000	-0.013	1-30-98	
			DT, 0.5	**	0.512	**	0.510		
10	F	1-30-98	dia, 0.0	0.004	**	0.000	0.027	3-2-97	4
			DT, 0.5	**	0.500	**	0.525		
11	V	3-2-98	dia, 0.0	0.008	**	0.000	-0.056	4-6-98	
			DT, 0.5	**	0.503	**	0.466		
12	N	4-6-98	dia, 0.0	-0.001	**	0.000	0.022	4-23-98	
			DT, 0.5	**	0.515	**	0.527		
13	A	4-23-98	dia, 0.0	-0.021	**	0.000	0.035	5-24-98	
			DT, 0.5	**	0.497	**	0.540		
14	F	5-24-98	dia, 0.0	0.010	**	0.000	0.000	7-1-98	
			DT, 0.5	**	0.512	**	0.512		

dia = dry in air
DT = depth test
** = no relevant information
Information taken from BNP calibration sheets.
Columns 4, 5, 6, 7, and 8 are distance in units of meter.

[1]Algae growth noted; unit started at odd time 17:11:23.
[2]Calibration date in deployment date column.
[3]Unit failed immediately after deployment.
[4]Calibrated in 0.5-m bath.

Table 36
CTD5 Depth Calibration Information

Deployment Number	Unit ID	Deployment Date	Depth Calibration Note	Pre-calibration Reading	Calibration Check Reading	Calibration Reading	Post-deployment Reading	Retrieval Date	Note
1	AE	6-6-97	**	**	**	**	**	7-10-97	1
2	M	7-10-97	**	**	**	**	**	7-29-97	2
3	A	7-28-97	dia, 0.0	0.000	**	0.000	0.017	8-15-97	3
4	B*	8-15-97	dia, 0.0	0.103	**	0.000	-0.061	9-10-97	
5	I	9-10-97	dia, 0.0	-0.018	**	0.000	0.014	10-3-97	
6	A	10-3-97	dia, 0.0	-0.017	**	0.001	0.000	10-30-97	
7	D	10-29-97	dia, 0.0	0.002	**	0.000	-0.072	12-5-97	3
			DT, 0.5	**	0.502	**			
8	T*	12-5-97	dia, 0.0	-0.023	**	0.000	0.037	1-29-98	
			DT, 0.5	**	0.501	**	0.557		
9	Q	1-29-98	dia, 0.0	0.046	**	0.000	0.082	2-29-98	
			DT, 0.5	**	0.507	**	0.604		
10	N	2-20-98	dia, 0.0	0.004	**	0.000	0.036	4-1-98	
			DT, 0.5	**	0.509	**	0.506		
11	T*	4-1-98	dia, 0.0	0.001	**	0.000	0.041	4-29-98	
			DT, 0.5	**	0.510	**	0.543		
12	R	4-29-97	dia, 0.0	-0.008	**	0.000	-0.029	5-24-98	
			DT, 0.5	**	0.508	**	0.487		
13	I	5-24-98	dia, 0.0	-0.007	**	0.000	-0.008	7-1-98	4

dia = dry in air
DT = depth test
** = no relevant information
Information taken from BNP calibration sheets.
Columns 4, 5, 6, 7, and 8 are distance in units of meter.

[1]Batteries flooded; six days data only.
[2]Instrument reads depth, 0.500 m in laboratory.
[3]Calibration depth in deployment date column.
[4]Unit was lying on its side at recovery; float missing.

Table 37
CTD6 Depth Calibration Information

Deployment Number	Unit ID	Deployment Date	Depth Calibration Note	Pre-calibration Reading	Calibration Check Reading	Calibration Reading	Post-deployment Reading	Retrieval Date	Note
1	AF	6-6-97	**	**	**	**	**	7-10-97	
2	O	7-10-97	**	**	**	**	**	7-29-97	
3	Y*	7-28-97	dia, 0.0	0.105	**	0.000	-0.015	8-15-97	1
4	X	8-15-97	dia, 0.0	0.124	**	0.000	-0.039	9-10-97	
5	P	9-10-97	dia, 0.0	-0.022	**	0.000	0.028	10-3-97	
6	Q	10-3-97	dia, 0.0	0.000	**	0.000	0.216	10-30-97	
7	O	10-29-97	dia, 0.0	0.004	**	0.000	-0.065	12-5-97	
			DT, 0.5	**	0.504	**	**		
8	F	12-5-97	dia, 0.0	-0.025	**	0.000	0.047	1-29-97	
			DT, 0.5	**	0.490	**	0.575		
9	W	1-29-98	dia, 0.0	-0.006	**	0.000	0.089	3-26-98	
			DT, 0.5	**	0.517	**	0.617		
10	X	3-26-98	dia, 0.0	0.001	**	0.000	0.029	4-29-98	
			DT, 0.5	**	0.509	**	0.548		
11	P	4-29-98	dia, 0.0	-0.017	**	0.000	-0.002	5-24-98	
			DT, 0.5	**	0.516	**	0.509		
12	L	5-24-98	dia, 0.0	-0.003	**	0.000	-0.034	7-1-98	
			DT, 0.5	**	0.505	**	0.488		

dia = dry in air
DT = depth test
** = no relevant information
Information taken from BNP calibration sheets.
Columns 4, 5, 6, 7, and 8 are distance in units of meter.

[1]Calibration date in deployment date column.

Table 38
CTD7 Depth Calibration Information

Deployment Number	Unit ID	Deployment Date	Depth Calibration Note	Pre-calibration Reading	Calibration Check Reading	Calibration Reading	Post-deployment Reading	Retrieval Date	Note
1	AG	6-6-97	**	**	**	**	**	7-10-97	1
2	Z	7-10-97	**	**	**	**	**	7-29-97	
3	T*	7-28-97	dia, 0.0	0.104	**	0.000	0.005	8-15-97	2
4	S	8-15-97	dia, 0.0	-0.006	**	0.000	**	**	3
5	C	9-10-97	dia, 0.0	-0.013	**	0.000	0.067	10-8-97	
6	N	10-8-97	dia, 0.0	**	**	0.000	-0.017	10-30-97	
7	M	10-29-97	dia, 0.0	0.003	**	0.000	-0.058	12-5-97	2
			DT, 0.5	**	0.501	**	**		
8	Y*	12-5-97	dia, 0.0	-0.024	**	0.000	-0.069	**	4
			DT, 0.5	**	0.503	**	0.440		
9	M	2-2-98	dia, 0.0	-0.004	**	0.000	0.103	3-26-98	2
			DT, 0.5	**	0.508	**	0.611		
10	C	3-26-98	dia, 0.0	0.007	**	0.000	0.035	4-29-98	
			DT, 0.5	**	0.490	**	0.537		
11	L	4-29-98	dia, 0.0	-0.004	**	0.000	-0.026	5-21-98	
			DT, 0.5	**	0.505	**	0.492		
12	E	5-21-98	dia, 0.0	0.011	**	0.000	-0.018	7-1-98	
			DT, 0.5	**	0.505	**	0.493		

dia = dry in air
DT = depth test
** = no relevant information
Information taken from BNP calibration sheets.
Columns 4, 5, 6, 7, and 8 are distance in units of meter.

[1]All parameters (depth, etc.) were off.
[2]Calibration date in deployment date column.
[3]Unit missing.
[4]"Unit stopped" 2-2-98; Retrieval date uncertain, probably 2-6-98.

Table 39
CTD8 Depth Calibration Information

Deployment Number	Unit ID	Deployment Date	Depth Calibration Note	Pre-calibration Reading	Calibration Check Reading	Calibration Reading	Post-deployment Reading	Retrieval Date	Note
1	AH	6-11-97	**	**	**	**	**	7-15-97	
2	Q	7-14-97	**	**	**	**	**	8-1-97	1
3	D	8-1-97	dia, 0.0	0.111	**	0.000	-0.022	8-21-97	
4	T*	8-19-97	dia, 0.0	0.003	**	0.000	-0.052	9-17-97	1
5	X	9-11-97	dia, 0.0	-0.008	**	0.000	0.053	10-8-97	1
6	I	10-8-97	dia, 0.0	0.024	**	0.000	-0.042	11-6-97	
7	Q	11-6-97	dia, 0.0	0.056	**	0.000	0.037	12-10-97	
			DT, 0.5	0.610	**	0.501	0.557		
8	D	12-10-97	dia, 0.0	-0.006	**	0.000	-0.076	2-6-98	
			DT, 0.5	**	0.504	**	0.435		
9	P	2-1-98	dia, 0.0	-0.002	**	0.000	0.065	3-20-98	1
			DT, 0.5	**	0.507	**	0.599		
10	B*	3-26-98	dia, 0.0	0.014	**	0.000	-0.039	4-21-98	
			DT, 0.5	**	0.508	**	0.470		
11	F	4-21-98	dia, 0.0	0.012	**	0.000	0.022	5-21-98	
			DT, 0.5	**	0.507	**	0.552		
12	W	5-21-98	dia, 0.0	-0.007	**	0.000	-0.005	6-28-98	
			DT, 0.5	**	0.505	**	0.516		

dia = dry in air
DT = depth test
** = no relevant information
Information taken from BNP calibration sheets.
Columns 4, 5, 6, 7, and 8 are distance in units of meter.

[1]Calibration date in deployment date column.

Table 40
CTD9 Depth Calibration Information

Deployment Number	Unit ID	Deployment Date	Depth Calibration Note	Pre-calibration Reading	Calibration Check Reading	Calibration Reading	Post-deployment Reading	Retrieval Date	Note
1	Al	6-11-97	**	**	**	**	**	7-15-97	
2	x	7-14-97	**	**	**	**	**	**	1
3	O	8-1-97	dia, 0.0	0.146	**	0.000	-0.030	8-21-97	
4	Y*	8-19-97	dia, 0.0	0.000	**	0.000	-0.030	9-19-97	
5	E	9-11-97	dia, 0.0	0.007	**	0.000	-0.035	10-9-97	2
6	P	10-9-97	dia, 0.0	0.022	**	0.000	-0.047	11-6-97	
7	N	11-6-97	dia, 0.0	-0.012	**	0.000	-0.091	12-10-97	3
			DT, 0.5	0.583	**	0.500	0.434		
8	M	12-10-97	dia, 0.0	-0.010	**	0.000	0.008	1-30-98	
			DT, .05	**	0.502	**	0.524		
9	T*	1-30-98	dia, 0.0	0.003	**	0.000	-0.021	3-30-98	
			DT, 0.5	**	0.505	**	0.512		
10	P	3-30-98	dia, 0.0	0.022	**	0.000	-0.109	4-21-98	
			DT, 0.5	**	0.499	**	0.408		
11	I	4-21-98	dia, 0.0	-0.014	**	0.000	-0.025	5-21-98	
			DT, 0.5	**	0.483	**	0.506		
12	N	5-21-98	dia, 0.0	-0.001	**	0.000	-0.015	6-29-98	
			DT, 0.5	**	0.511	**	0.508		

dia = dry in air
DT = depth test
** = no relevant information
Information taken from BNP calibration sheets.
Columns 4, 5, 6, 7, and 8 are distance in units of meter.

[1]Log sheet missing
[2]Calibration date in deployment date column.
[3]Fouling on DO membrane.

Table 41
CTD10 Depth Calibration Information

Deployment Number	Unit ID	Deployment Date	Depth Calibration Note	Pre-calibration Reading	Calibration Check Reading	Calibration Reading	Post-deployment Reading	Retrieval Date	Note
1	Q	12-15-97	dia, 0.0	0.003	**	0.000	0.159	1-27-98	--
			DT, 0.5	**	0.525	**	0.681		
2	X	1-27-98	dia, 0.0	0.001	**	0.000	-0.090	3-19-98	--
			DT, 0.5	**	0.496	**	0.438		
3	A	3-19-98	dia, 0.0	0.019	**	0.000	-0.083	4-21-98	--
			DT, 0.5	**	0.475	**	0.427		
4	E	4-21-98	dia, 0.0	-0.011	**	0.000	-0.025	5-19-98	--
			DT, 0.5	**	0.509	**	0.538		
5	V	5-19-98	dia, 0.0	0.008	**	0.000	-0.006	6-25-98	--
			DT, 0.5	**	0.517	**	0.519		

dia = dry in air
DT = depth test
** = no relevant information
Information taken from BNP calibration sheets.
Columns 4, 5, 6, 7, and 8 are distance in units of meter.

Table 42
CTD11 Depth Calibration Information

Deployment Number	Unit ID	Deployment Date	Depth Calibration Note	Pre-calibration Reading	Calibration Check Reading	Calibration Reading	Post-deployment Reading	Retrieval Date	Note
1	AK	6-11-97	**	**	**	**	**	**	
2	S	7-14-97	**	**	**	**	**	8-1-97	1, 2
3	M	8-1-97	dia, 0.0	0.147	**	0.000	-0.029	8-21-97	
4	A	8-19-97	dia, 0.0	0.004	**	0.000	-0.066	9-17-97	1, 3
5	B*	9-11-97	dia, 0.0	-0.011	**	0.000	0.042	10-20-97	1
6	E	10-20-97	dia, 0.0	0.012	**	0.000	-0.049	11-6-97	
7	A	11-6-97	dia, 0.0	-0.009	**	0.000	-0.087	12-9-97	4
			DT, 0.5	0.598	**	0.501	0.433		
8	O	12-10-97	dia, 0.0	-0.006	**	0.000	0.096	6-29-97	5
			DT, 0.5	**	0.508	**	0.595		
9	C	1-27-98	dia, 0.0	0.014	**	0.000	-0.077	3-30-98	
			DT, 0.5	**	0.497	**	0.431		
10	R	3-19-98	dia, 0.0	0.004	**	0.000	-0.074	4-27-98	
			DT, 0.5	**	0.507	**	0.460		
11	N	4-27-98	dia, 0.0	-0.029	**	0.000	-0.028	5-19-98	
			DT, 0.5	**	0.507	**	0.498		
12	Y*	5-19-98	dia, 0.0	-0.001	**	0.000	-0.045	6-25-98	3
			DT, 0.5	**	0.509	**	0.502		
13	M	6-24-98	dia, 0.5	0.017	**	0.000	-0.047	8-14-98	3
			DT, 0.5	**	0.512	**	0.494		

dia = dry in air
DT = depth test
** = no relevant information
Information taken from BNP calibration sheets.
Columns 4, 5, 6, 7, and 8 are distance in units of meter.

[1]Calibration date in deployment date column.
[2]Stopped 7-6-97; "YSI said it was lightning."
[3]Heavy fouling.
[4]Unit came loose 12-5-97; retrieved adrift (South Beach Jetty).
[5]Recovered at Rosenstiel School of Marine and Atmospheric Sciences (RSMAS) 6-29-98.

Table 43
CTD12 Depth Calibration Information

Deployment Number	Unit ID	Deployment Date	Depth Calibration Note	Pre-calibration Reading	Calibration Check Reading	Calibration Reading	Post-deployment Reading	Retrieval Date	Note
1	AB	6-18-97	**	**	**	**	**	7-15-97	1
2	P	7-14-97	**	**	**	**	**	8-1-97	1, 2
3	x	x	**	**	**	**	**	x	3
4	F	8-19-97	dia, 0.0	0.003	**	0.000		9-17-97	2
5	W	9-15-97	dia, 0.0	0.128	**	0.000	0.026	10-20-97	1, 2
6	X	10-20-97	dia, 0.0	0.012	**	0.000	-0.036	11-6-97	
7	Z	11-6-97	dia, 0.0	0.000	**	**	-0.034	12-10-97	
			DT, 0.5	0.600	**	0.502	0.466		
8	W	12-10-97	dia, 0.0	-0.013	**	0.000	-0.003	1-27-98	4
			DT, 0.5	**	0.501	**	0.520		
9	B*	1-26-98	dia, 0.0	-0.014	**	0.000	-0.021	3-19-98	
			DT, 0.5	**	0.501	**	0.486		
10	L	3-19-98	dia, 0.0	0.110	**	0.000	-0.082	4-27-98	1, 5
			DT, 0.5	**	0.504	**	0.471		
11	W	4-27-98	dia, 0.0	-0.010	**	0.000	-0.068	5-19-98	
			DT, 0.5	**	0.508	**	0.466		
12	Q	5-19-98	dia, 0.0	0.097	**	0.000	0.330	6-25-98	1
			DT, 0.5	**	0.516	**	0.848		

dia = dry in air
DT = depth test
** = no relevant information
Information taken from BNP calibration sheets.
Columns 4, 5, 6, 7, and 8 are distance in units of meter.

[1]Heavy fouling (barnacles).
[2]Calibration date in deployment date column.
[3]No log sheet for 8-1 to 8-19-97 period.
[4]Fouling on DO membrane.
[5]Shrimp living inside conductivity orifice.

Table 44
Depth Calibration Statistics

CTD Location	Mean Absolute Drift	Deployments Averaged	Largest Drift*	Note
1	0.120	10	0.573	1
2	0.030	10	-0.072	
3	0.043	10	0.223	2
4	0.037	11	-0.056	
5	0.036	11	0.082	
6	0.056	10	0.216	
7	0.044	9	0.103	
8	0.041	10	-0.076	
9	0.041	10	-0.109	
10	0.073	5	0.0159	
11	0.058	11	0.096	3
12	0.069	9	0.330	4

* Columns 2 and 4 are distance in units of meter.

1 Unit not running when recovered.
2 Unit was found lying on ground. Float was broken.
3 Not recovered at site (Julia Tuttle). Recovered at RSMAS.
4 A lot of barnacle growth.

Table 45
CTD1 Tidal Data Limits and Deployment Information

File Name	Start			Start Good			End Good			End		
	Date	Time	Depth	Date	Time	Depth	Date	Time	Depth	Date	Time	Depth
07087T01.TXT	06/04/97	2000	.388m	06/06/97	1300	1.884m	07/08/97	1445	1.875m	07/09/97	1130	.528m
07217T01.TXT	07/08/97	0930	1.305ft	07/08/97	1330	6.087ft	07/18/97	1230	6.037ft	07/21/97	0715	1.234ft
08057T01.TXT	07/18/97	0800	.462m	07/18/97	1200	1.955m	08/05/97	1100	1.806m	08/05/97	1315	.475m
08277T01.TXT	08/04/97	1230	.000m	08/05/97	1045	1.358m	08/27/97	1100	1.409m	08/27/97	1430	-.058m
09197T01.TXT	08/26/97	1300	.000m	08/27/97	1045	1.491m	09/19/97	1045	1.448m	09/19/97	1345	.021m
10227T01.TXT	09/18/97	1315	-.001m	09/19/97	1015	1.402m	10/22/97	1000	1.520m	10/22/97	1400	-.002m
11197T01.TXT	10/21/97	1300	-.003m	10/22/97	0945	1.524m	11/19/97	1130	1.222m	11/19/97	1530	-.024m
12177T01.TXT	11/10/97	1500	-.005m	11/19/97	1115	1.268m	12/17/97	1200	1.333m	12/17/97	1515	-.042m
02178T01.TXT	12/16/97	2030	.003m	12/17/97	1130	1.349m	02/14/98	2030	1.999m	02/14/98	2030	1.999m
04018T01.TXT	02/07/98	1300	.012m	02/17/98	1245	1.253m	03/29/98	1230	1.504m	03/29/98	1230	1.504m
05048T01.TXT	03/31/98	1700	.000m	04/01/98	1145	1.304m	05/04/98	1230	1.609m	05/04/98	1445	.406m
06018T01.TXT	05/04/98	0030	-.003m	05/04/98	1215	1.235m	06/01/98	1130	1.352m	06/01/98	1430	-.010m
07098T01.TXT	05/28/98	1300	-.026m	06/01/98	1115	1.337m	07/09/98	1030	1.283m	07/09/98	1445	-.035m

Note: 04018T01.TXT has no salinity
07217T01.TXT depth in ft no battery value
Units of depth, as recorded by the CTD, are given m = meter, ft = foot.

Table 46
CTD2 Tidal Data Limits and Deployment Information

File Name	Start			Start Good			End Good			End		
	Date	Time	Depth	Date	Time	Depth	Date	Time	Depth	Date	Time	Depth
07087T02.TXT	06/11/97	1430	.412m	06/13/97	1300	1.980m	07/08/97	1515	2.115m	07/09/97	1330	.456m
07217T02.TXT	07/08/97	0930	.115ft	07/08/97	1415	5.726ft	07/18/97	1245	5.485ft	07/21/97	0800	.088ft
08057T02.TXT	07/18/97	0745	.423m	07/18/97	1145	2.074m	08/05/97	1130	2.070m	08/05/97	1415	.418m
08277TO2.TXT	08/04/97	1345	.002m	08/05/97	1030	1.563m	08/27/97	1130	1.550m	08/28/97	0715	-.021m
09197T02.TXT	08/26/97	1330	.001m	08/27/97	1015	1.649m	09/19/97	1045	1.718m	09/19/97	1445	.026m
10227T02.TXT	09/18/97	1315	.000m	09/19/97	1000	1.696m	10/22/97	1015	1.756m	10/22/97	1245	.026m
11197T02.TXT	10/21/97	1300	-.008m	10/22/97	0930	1.756m	11/19/97	1145	1.522m	11/19/97	1500	.082m
12177T02.TXT	11/10/97	1030	-.002m	11/19/97	1101	1.469m	12/17/97	1201	1.670m	12/17/97	1546	-.009m
02178T02.TXT	12/16/97	2100	-.098m	12/17/97	1115	1.683m	02/14/98	2100	1.677m	02/14/98	2100	1.677m
04018T02.TXT	02/07/98	1800	.001m	02/17/98	1230	1.514m	04/01/98	1100	1.577m	04/02/98	0845	.056m
05048T02.TXT	03/31/98	1700	.010m	04/01/98	1030	1.506m	05/04/98	1245	1.350m	05/04/98	1600	-.035m
06018T02.TXT	05/04/98	0100	-.037m	05/04/98	1200	1.346m	06/01/98	1145	1.553m	06/01/98	1345	-.056m
07098T02.TXT	05/28/98	1300	.017m	06/01/98	1100	1.571m	07/09/98	1100	1.635m	07/09/98	1545	.002m

Note: 07217T02.TXT depth in ft
09197T02.TXT no salinity
10227T02.TXT no salinity
Units of depth, as recorded by the CTD, are given m = meter, ft = foot.

Table 47
CDT3 Tidal Data Limits and Deployment Information

File Name	Start			Start Good			End Good			End		
	Date	Time	Depth	Date	Time	Depth	Date	Time	Depth	Date	Time	Depth
07037T03.TXT	06/04/97	2000	.383m	06/06/97	1332	2.235m	07/02/97	1302	2.120m	07/03/97	1517	.428m
07217T03.TXT	07/02/97	0730	.407m	07/02/97	1200	2.109m	07/18/97	1315	2.068m	07/21/97	0915	.451m
08057T03.TXT	07/18/97	0800	.446m	07/18/97	1130	2.228m	08/05/97	1200	2.297m	08/05/97	1445	.438m
08277T03.TXT	08/04/97	1430	-.003m	08/05/97	1015	1.749m	08/27/97	1145	1.605m	08/28/97	0800	-.053m
09197T03.TXT	08/26/97	1330	.000m	08/27/97	1000	1.711m	09/19/97	1115	1.837m	09/19/97	1415	.020m
10227T03.TXT	09/18/97	1330	.000m	09/19/97	0945	1.764m	10/22/97	1100	1.795m	10/22/97	1215	.019m
11197T03.TXT	10/21/97	1500	.003m	10/22/97	0915	1.805m	11/19/97	1200	1.661m	11/19/97	1415	.016m
12177T03.TXT	11/10/97	1100	.000m	11/19/97	1045	1.586m	12/17/97	1230	1.835m	12/17/97	1645	-0.11m
02188T03.TXT	12/15/97	1730	.016m	12/17/97	1045	1.785m	01/24/98	0900	1.714m	01/24/98	0900	1.714m
03278T03.TXT	02/18/98	1045	.014m	02/18/98	1330	1.644m	03/27/98	1345	2.332m	03/27/98	1445	.226m
04238T03.TXT	03/27/98	1230	.000m	03/27/98	1315	1.786m	04/23/98	1430	1.425m	04/23/98	1615	-.075m
05048T03.TXT	04/22/98	1900	.003m	04/23/98	1415	1.529m	05/04/98	1300	1.454m	05/04/98	1730	-.031m
06018T03.TXT	05/04/98	0100	-.002m	05/05/98	1145	1.498m	06/01/98	1215	1.648m	06/01/98	1500	-.029m
07098T03.TXT	05/29/98	1500	-.001m	06/01/98	1045	1.637m	07/09/98	1115	1.720m	07/09/98	1345	.008m
08048T03.TXT	07/06/98	1800	.007m	07/09/98	0930	1.755m	08/04/98	1400	1.601m	08/05/98	1100	.042m

Note: 0721T03.TXT internal error
No data 01/24/98 (0900) – 02/18/98 (1330)
Units of depth, as recorded by the CTD, are given m = meter, ft = foot.

Table 48
CDT4 Tidal Data Limits and Deployment Information

File Name	Start			Start Good			End Good			End		
	Date	Time	Depth	Date	Time	Depth	Date	Time	Depth	Date	Time	Depth
07117T04.TXT	06/04/97	1711	.382m	06/06/97	1411	2.577m	07/10/97	1156	2.484m	07/11/97	1326	.490m
07317T04.TXT	07/08/97	1200	.379m	07/10/97	1045	2.366m	07/29/97	1415	2.127m	07/31/97	1300	.379m
08157T04.TXT	07/29/97	0845	.009m	07/29/97	1145	1.845m	08/15/97	1200	1.921m	08/18/97	0830	.029m
09107T04.TXT	08/15/97	0815	.010m	08/15/97	1000	2.127m	09/10/97	1115	1.928m	09/10/97	1400	-054m
10037T04.TXT	09/09/97	1515	.002m	09/10/97	0845	2.075m	10/03/97	1000	2.297m	10/03/97	1200	.041m
10307T04.TXT	10/02/97	0815	.000m	10/03/97	0900	2.127m	10/30/97	1230	2.212m	10/31/97	0830	.030m
12087T04.TXT	10/29/97	1315	-.007m	10/30/97	1045	2.334m	12/08/97	1030	1.840m	12/08/97	1245	-010m
01308T04.TXT	01/06/98	0930	.021m	01/07/98	1015	1.912m	01/30/97	1245	2.416m	02/01/98	1245	-.007m
03028T04.TXT	01/29/98	1500	-.008m	01/30/98	1000	2.218m	03/02/98	1500	2.148m	03/03/98	0815	.027m
04068T04.TXT	02/24/98	1000	.002m	03/02/98	1446	2.123m	04/06/98	1616	2.094m	04/07/98	0716	-.057m
04238T04.TXT	04/06/98	0930	.014m	04/06/98	1115	2.070m	04/23/98	1315	1.832m	04/23/98	1545	.021m
05248T04.TXT	04/22/98	1900	-.006m	04/23/98	1015	2.109m	05/24/98	1315	1.982m	05/26/98	0745	.020m
07018T04.TXT	05/23/98	1500	.000m	05/24/98	1145	2.134m	07/01/98	1245	2.029m	07/06/98	1500	-.009m

Note: 07317T04.TXT no salinity no DO mg/l
08157T04.TXT no salinity internal error
03028T04.TXT no salinity
04068T04.TXT no DO
No data 12/08/97 (1030) – 01/07/98 (1015)
Units of depth, as recorded by the CTD, are given m = meter, ft = foot.

Table 49
CDT5 Tidal Data Limits and Deployment Information

File Name	Start			Start Good			End Good			End		
	Date	Time	Depth	Date	Time	Depth	Date	Time	Depth	Date	Time	Depth
07107T05.TXT	06/04/97	2000	.400m	06/06/97	1445	1.247m	06/10/97	0515	1.411m	06/10/97	0515	1.411m
07317T05.TXT	07/09/97	0515	.505m	07/10/97	1315	1.500m	07/29/97	1400	1.034m	07/31/97	0815	.500m
08157T05.TXT	07/29/97	0845	-.021m	07/29/97	1215	.634m	08/15/97	1145	.701m	08/18/97	0730	.004m
09107T05.TXT	08/14/97	1530	-.008m	08/15/97	0947	.914m	09/10/97	1102	.673m	09/10/97	1247	-.043m
10037T05.TXT	09/09/97	1700	-.009m	09/10/97	1000	.880m	10/03/97	1100	1.017m	10/03/97	1345	.024m
10307T05.TXT	10/02/97	0930	.000m	10/03/97	0915	.890m	10/30/97	1215	.975m	10/31/97	0900	-.017m
12057T05.TXT	10/29/97	1300	-.012m	10/30/97	1030	1.312m	12/05/97	1200	.813m	12/05/97	1545	-.078m
01298T05.TXT	12/04/97	1630	-.017m	12/05/97	1000	.638m	01/29/98	1045	1.204m	01/29/98	1230	.059m
02208T05.TXT	01/28/98	1500	.001m	01/29/98	1000	1.085m	02/20/98	1245	.649m	02/20/98	1500	.086m
04018T05.TXT	02/20/98	1100	.019m	02/20/98	1230	.566m	03/28/98	0945	1.306m	03/28/98	0945	1.306m
04298T05.TXT	03/31/98	1700	.013m	04/01/98	1315	1.057m	04/29/98	1115	1.074m	04/29/98	1400	.039m
05248T05.TXT	04/28/98	1630	.001m	04/29/98	0930	.811m	05/24/98	1300	.702m	05/26/98	0730	-.028m
07018T05.TXT	05/23/98	1500	-.005m	05/24/98	1226	.851m	07/01/98	1326	1.038m	07/06/98	0711	-.006m

Note: 12057T05.TXT no salinity
12057T05.TXT internal error 12/02/97 1630
No data 06/10/97 (0515) – 07/10/97 (1315)
Units of depth, as recorded by the CTD, are given m = meter, ft = foot.

Table 50
CDT6 Tidal Data Limits and Deployment Information

File Name	Start			Start Good			End Good			End		
	Date	Time	Depth	Date	Time	Depth	Date	Time	Depth	Date	Time	Depth
07107T06.TXT	06/04/97	2000	.400m	06/06/97	1500	1.661m	07/10/97	1245	1.788m	07/11/97	1115	.506m
07317T06.TXT	07/09/97	1545	.492m	07/10/97	1130	1.746m	07/29/97	1345	1.420m	07/31/97	1245	.487m
08157T06.TXT	07/28/97	1600	.348m	07/29/97	1230	.947m	08/15/97	1130	1.123m	08/15/97	1400	-.017m
09107T06.TXT	08/14/97	1530	-.006m	08/15/97	1015	1.265m	09/10/97	1045	1.104m	09/10/97	1315	-.039m
10037T06.TXT	09/09/97	1545	.003m	09/10/97	0930	1.172m	10/03/97	0945	1.433m	10/03/97	1130	.028m
10307T06.TXT	10/02/97	0845	-.002m	10/03/97	0930	1.412m	10/30/97	1200	1.650m	10/31/97	0930	.222m
12057T06.TXT	10/29/97	1245	-.009m	10/30/97	1100	1.495m	12/05/97	1145	1.255m	12/05/97	1500	-.666m
01298T06.TXT	12/04/97	1700	.000m	12/05/97	1045	1.174m	01/29/98	1015	1.619m	01/29/98	1059	.060m
03268T06.TXT	01/28/98	1530	.006m	01/29/98	1000	1.584m	03/26/98	1400	1.207m	03/26/98	1800	.104m
04298T06.TXT	03/23/98	1330	-.003m	03/26/98	1345	1.223m	04/29/98	1100	1.487m	04/29/98	1145	.026m
05248T06.TXT	04/28/98	1630	.002m	04/29/98	0945	1.294m	05/24/98	1245	1.153m	05/26/98	0730	.001m
07018T06.TXT	05/23/98	1530	.007m	05/24/98	1245	1.152m	07/01/98	1230	1.068m	07/06/98	0915	-.028m

Note: 01298T06.TXT no salinity
Units of depth, as recorded by the CTD, are given m = meter, ft = foot.

Table 51
CDT7 Tidal Data Limits and Deployment Information

File Name	Start			Start Good			End Good			End		
	Date	Time	Depth	Date	Time	Depth	Date	Time	Depth	Date	Time	Depth
07107T07.TXT	06/06/97	1130	1.381ft	06/06/97	1515	61.841ft	07/10/97	1330	205.565ft	07/10/97	2000	239.770ft
07317T07.TXT	07/09/97	1600	.435m	07/10/97	1215	2.523m	07/29/97	1315	1.983m	07/29/97	1315	1.983m
10087T07.TXT	09/09/97	1530	-.008m	09/10/97	1000	1.730m	10/08/97	1315	2.224m	10/09/97	1200	.066m
10307T07.TXT	10/06/97	1100	.006m	10/08/97	1145	1.989m	10/30/97	1130	1.931m	10/31/97	1000	-.027m
12057T07.TXT	10/27/97	1315	-.022m	10/30/97	1115	2.028m	12/05/97	1130	1.899m	12/05/97	1400	-.063m
02068T07.TXT	12/04/97	1730	-.010m	12/05/97	1115	1.957m	02/02/98	1730	2.089m	02/02/98	1730	2.089m
03268T07.TXT	02/02/98	1030	-.013m	02/06/98	1015	1.808m	03/26/98	0130	1.728m	03/26/98	0130	1.728m
04298T07.TXT	03/23/98	1400	-.002m	03/26/98	1000	2.166m	04/29/98	1030	2.156m	04/29/98	1230	.027m
05218T07.TXT	04/28/98	1700	.007m	04/29/98	1015	2.095m	05/21/98	1030	1.580m	05/21/98	1500	-.040m
07018T07.TXT	05/20/98	1600	.018m	05/21/98	0845	1.726m	07/10/98	1145	1.679m	07/06/98	0815	-.025m

Note: 07107T07.TXT depth kicked out depth too great range 1-200 ft
No data 07/29/97 (1315) – 09/10/97 (1000)
Units of depth, as recorded by the CTD, are given m = meter, ft = foot.

Table 52
CDT8 Tidal Data Limits and Deployment Information

File Name	Start			Start Good			End Good			End		
	Date	Time	Depth	Date	Time	Depth	Date	Time	Depth	Date	Time	Depth
07167T08.TXT	06/10/97	1400	.457m	06/12/97	1230	2.645m	07/15/97	1515	2.509m	07/16/97	1115	.495m
08047T08.TXT	07/14/97	1315	.462m	07/15/97	1400	2.480m	08/01/97	1500	2.198m	08/04/97	0845	.498m
08217T08.TXT	07/31/97	1615	-.002m	08/01/97	1015	2.120m	08/21/97	1330	2.311m	08/25/97	0815	-.021m
09177T08.TXT	08/19/97	1030	.000m	08/21/97	0930	2.331m	09/17/97	1330	1.969m	09/17/97	1500	-.0471m
10087T08.TXT	09/11/97	1315	-.002m	09/17/97	0845	2.611m	10/08/97	1230	2.368m	10/09/97	1125	.055m
11067T08.TXT	10/06/97	1145	.064m	10/08/97	1215	2.337m	11/06/97	1430	2.357m	11/07/97	1034	-.044m
12107T08.TXT	10/31/97	1315	.014m	11/06/97	1045	2.138m	12/10/97	1600	2.168m	12/12/97	0930	.038m
02068T08.TXT	12/10/97	0845	-001m	12/10/97	1045	1.822m	02/06/98	1100	1.794m	02/06/98	1345	-.077m
03268T08.TXT	02/01/98	1500	-.006m	02/06/98	1045	1.943m	03/18/98	1215	2.395m	03/18/98	1215	2.395m
04218T08.TXT	03/26/98	0900	.119m	03/26/98	1200	2.047m	04/21/98	1130	1.706m	04/21/98	1530	-.046m
05218T08.TXT	04/21/98	0800	.015m	04/21/98	0945	1.762m	05/21/98	1015	1.843m	05/21/98	1415	.027m
06298T08.TXT	05/20/98	1630	.017m	05/21/98	0900	1.942m	06/29/98	1230	2.262m	06/30/98	0915	.498m

Note: 08217T08.TXT no salinity
02068T08.TXT no salinity
10087T08.TXT internal error 09/16/97 1415
No data 03/18/98 (1215) – 03/26/98 (1200)
Units of depth, as recorded by the CTD, are given m = meter, ft = foot.

Table 53
CDT9 Tidal Data Limits and Deployment Information

File Name	Start			Start Good			End Good			End		
	Date	Time	Depth	Date	Time	Depth	Date	Time	Depth	Date	Time	Depth
07167T09.TXT	06/10/97	1400	1.354ft	06/12/97	1345	17.410ft	07/15/97	1430	16.382ft	07/16/97	1251	1.484ft
08047T09.TXT	07/14/97	1315	.500m	07/15/97	1315	4.939m	08/01/97	1430	4.708m	08.04/97	0734	.518m
08217T09.TXT	07/31/97	1630	.002m	08/01/97	1045	4.433m	08/21/97	1300	4.792m	08/25/97	0730	-.033m
09177T09.TXT	08/19/97	1100	0m	08/21/97	1000	5.021m	09/17/97	1300	4.372m	09/18/97	0730	-.046m
10097T09.TXT	09/11/97	1330	-.003m	09/17/97	0900	5.136m	10/09/97	0945	4.453m	10/09/97	1249	.037m
11067T09.TXT	10/06/97	1200	.000m	10/09/97	0930	4.417m	11/06/97	1400	4.813m	11/07/97	0845	-.046m
12107T09.TXT	10/31/97	1300	-.006m	11/06/97	1100	4.754m	12/10/97	1545	4.594m	12/12/97	0815	-.093m
01308T09.TXT	12/10/97	0915	-.006m	12/10/97	1530	4.711m	01/30/98	1200	4.831m	02/01/98	1130	-.002m
03308T09.TXT	01/29/98	1600	-.008m	01/30/98	1030	5.048m	03/30/98	1300	4.537m	03/30/98	1430	.000m
04218T09.TXT	03/27/98	1145	.013m	03/30/98	1230	4.555m	04/21/98	1115	4.124m	04/21/98	1430	-.113m
05218T09.TXT	04/21/98	0800	-.037m	04/21/98	1500	4.180m	05/21/98	1000	4.166m	05/21/98	1345	-.024m
06298T09.TXT	05/20/98	1630	.014m	05/21/98	0930	4.182m	06/29/98	1200	4.773m	06/30/98	0830	-.015m

Note: 05218T09.TXT internal error 04/24/98 0700
01308T09.TXT internal error
07167T09.TXT depth in ft
11067T09.TXT internal error
12107T09.TXT internal error 12/12/97 (0830)
Units of depth, as recorded by the CTD, are given m = meter, ft = foot.

Table 54
CDT10 Tidal Data Limits and Deployment Information

File Name	Start			Start Good			End Good			End		
	Date	Time	Depth	Date	Time	Depth	Date	Time	Depth	Date	Time	Depth
01278T10.TXT	12/15/97	0900	.040m	12/15/97	1300	1.282m	01/27/98	1100	1.611m	01/28/98	0900	.169m
03198T10.TXT	01/26/98	1630	-012m	01/27/98	1115	1.380m	03/19/98	1145	1.528m	03/20/98	1300	-.075m
04218T10.TXT	03/19/98	0830	-.082m	03/19/98	1200	1.543m	04/21/98	1030	.981m	04/21/98	1345	-.066m
05198T10.TXT	04/20/98	1500	.006m	04/21/98	1045	1.044m	05/19/98	1045	1.244m	05/19/98	1615	-.007m
06258T10.TXT	05/18/98	1900	.002m	05/19/98	1115	1.303m	06/25/98	1000	1.787m	06/26/98	0845	.000m

Note: units of depth, as recorded by the CTD, are given m = meter, ft = foot.

Table 55
CDT11 Tidal Data Limits and Deployment Information

File Name	Start			Start Good			End Good			End		
	Date	Time	Depth	Date	Time	Depth	Date	Time	Depth	Date	Time	Depth
08017T11.TXT	07/14/97	1315	x	07/15/97	1045	x	07/26/97	0942	x	07/26/97	0942	x
08217T11.TXT	07/31/97	1630	.001m	08/01/97	1230	3.483m	08/21/97	1200	4.151m	08/25/97	0900	-.030m
09177T11.TXT	08/19/97	1215	-.016m	08/21/97	1145	4.179m	09/17/97	1130	3.854m	09/18/97	0900	-.082m
10207T11.TXT	09/11/97	1330	-.003m	09/17/97	1115	4.001m	10/20/97	1230	4.219m	10/21/97	0845	.039m
11067T11.TXT	10/20/97	0800	.023m	10/20/97	1215	4.164m	11/06/97	1315	3.949m	11/07/07	0915	-.039m
12127T11.TXT	10/31/97	1345	-.013m	11/06/97	1257	3.960m	12/03/97	1057	3.878m	12/12/97	1343	-.033m
03208T11.TXT	01/26/98	1630	-.021m	01/27/98	1215	3.540m	03/20/98	1100	3.630m	03/20/98	1615	-.089m
04278T11.TXT	03/17/98	1000	.015m	03/19/98	1245	3.764m	04/27/98	1215	3.611m	04/27/98	1545	-.088m
05198T11.TXT	04/26/98	2230	-.003m	04/27/98	1030	3.926m	05/19/98	1300	3.661m	05/19/98	1515	-.003m
06258T11.TXT	05/18/98	1900	.011m	05/19/98	1200	3.587m	06/25/98	1230	3.655m	06/26/98	0815	-.045m
08048T11.TXT	06/24/98	1100	.001m	06/25/98	1100	3.887m	08/04/98	0930	3.428m	08/05/98	1230	-.046m

Note: 08017T11.TXT no depth
08017T11.TXT internal error 07/25/97 2325 07/26/97 0957
12127T11.TXT internal error 12/05/97 1542 12/06/97 0358 12/06/97 1408
12/06/97 1608 12/08/97 1621 12/08/97 1821
12/09/97 0353
No data 12/03/97 (1057) – 01/27/98 (1215)
Units of depth, as recorded by the CTD, are given m = meter, ft = foot

Table 56
CDT12 Tidal Data Limits and Deployment Information

File Name	Start			Start Good			End Good			End		
	Date	Time	Depth	Date	Time	Depth	Date	Time	Depth	Date	Time	Depth
07167T12.TXT	06/17/97	1600	.469m	06/18/97	1430	1.988m	07/15/97	1300	2.028m	07/16/97	1245	.489m
08047T12.TXT	07/14/97	1515	.409m	07/15/97	1145	1.976m	08/01/97	1345	1.971m	08/04/97	1000	.405m
08217T12.TXT	07/31/97	1700	.000m	08/01/97	1330	1.583m	08/21/97	1100	2.369m	08/25/97	0930	-.025m
09177T12.TXT	08/19/97	1245	-.001m	08/21/97	1045	2.343m	09/17/97	1030	2.319m	09/18/97	0815	-.025m
10207T12.TXT	09/15/97	1530	.000m	09/17/97	1100	2.432m	10/20/97	1031	2.221m	10/21/97	0746	.012m
11067T12.TXT	10/20/97	0800	.029m	10/20/97	1015	2.122m	11/06/97	1215	2.157m	11/07/97	1045	-.036m
12107T12.TXT	10/31/97	1400	-.001m	11/06/97	1200	2.104m	12/10/97	1215	1.454m	12/12/97	1015	-.034m
01278T12.TXT	12/10/97	0915	-.025m	12/10/97	1200	1.529m	01/27/98	1345	1.680m	01/28/98	1000	-.003m
03198T12.TXT	01/26/98	1645	.006m	01/27/98	1330	1.720m	03/19/98	1345	2.085m	03/20/98	1430	-.021m
04278T12.TXT	03/17/98	1330	-.003m	03/19/98	1330	2.057m	04/27/98	1130	2.110m	04/27/98	1445	-.079m
05198T12.TXT	04/26/98	2300	-.001m	04/27/98	1100	2.124m	05/19/98	1230	1.793m	05/19/98	1500	-060m
06258T12.TXT	05/18/98	1900	-.002m	05/19/98	1215	1.885m	06/25/98	1145	2.604m	06/26/98	0715	.326m

Note: 10207T12.TXT internal error 10/10/97 2145
09177T12.TXT no salinity
Units of depth, as recorded by the CTD, are given m = meter, ft = foot

Table 57
CTD1 Salinity Data Limits and Deployment Information

File Name	Start			Start Good			End Good			End		
	Date	Time	PPT	Date	Time	PPT	Date	Time	PPT	Date	Time	PPT
07087T01.TXT	06/04/97	2000	00.00	06/06/97	1300	33.19	07/08/97	1445	23.50	07/09/97	1130	00.00
07217T01.TXT	07/08/97	0930	00.00	07/08/97	1330	23.56	07/18/97	1230	23.04	07/21/97	0715	00.03
08057T01.TXT	07/18/97	0800	00.00	07/18/97	1200	23.12	08/05/97	1100	22.95	08/05/97	1315	00.07
08277T01.TXT	08/04/97	1230	00.00	08/05/97	1045	22.96	08/27/97	1100	24.21	08/27/97	1430	00.14
09197T01.TXT	08/26/97	1300	00.00	08/27/97	1045	24.39	09/19/97	1045	21.96	09/19/97	1345	00.12
10227T01.TXT	09/18/97	1315	00.00	09/19/97	1015	21.10	10/22/97	1000	22.85	10/22/97	1400	35.78
11197T01.TXT	10/21/97	1300	00.00	10/22/97	0945	23.23	11/19/97	1130	22.14	11/19/97	1530	00.05
12177T01.TXT	11/10/97	1500	00.00	11/19/97	1115	21.98	12/17/97	1200	23.46	12/17/97	1515	00.53
02178T01.TXT	12/16/97	2030	00.00	12/17/97	1130	23.43	02/14/98	2030	20.09	02/14/98	2030	20.09
04018T01.TXT	02/07/98	1300	x	02/17/98	1245	x	03/29/98	1230	x	03/29/98	1230	x
05048T01.TXT	03/31/98	1700	00.00	04/01/98	1145	21.25	05/04/98	1230	22.69	05/04/98	1445	00.13
06018T01.TXT	05/04/98	0030	00.00	05/04/98	1215	22.79	06/01/98	1130	24.16	06/01/98	1430	00.14
07098T01.TXT	05/28/98	1300	00.00	06/01/98	1115	24.29	07/09/98	1030	26.78	07/09/98	1445	00.10

Note: 04018T01.TXT has no salinity
07217T01.TXT depth in ft no battery value

Table 58
CTD2 Salinity Data Limits and Deployment Information

File Name	Start			Start Good			End Good			End		
	Date	Time	PPT	Date	Time	PPT	Date	Time	PPT	Date	Time	PPT
07087T02.TXT	06/11/97	1430	00.00	06/13/97	1300	26.32	07/08/97	1515	25.01	07/09/97	1330	00.00
07217T02.TXT	07/08/97	0930	00.02	07/08/97	1415	25.09	07/18/97	1245	26.21	07/21/97	0800	00.05
08057T02.TXT	07/18/97	0745	00.00	07/18/97	1145	25.09	08/05/97	1130	25.21	08/05/97	1415	35.23
08277TO2.TXT	08/04/97	1345	00.00	08/05/97	1030	23.94	08/27/97	1130	26.42	08/28/97	0715	00.07
09197T02.TXT	08/26/97	1330	x	08/27/97	1015	x	09/19/97	1045	x	09/19/97	1445	x
10227T02.TXT	09/18/97	1315	x	09/19/97	1000	x	10/22/97	1015	x	10/22/97	1245	x
11197T02.TXT	10/21/97	1300	00.00	10/22/97	0930	26.97	11/19/97	1145	25.76	11/19/97	1500	00.01
12177T02.TXT	11/10/97	1030	00.00	11/19/97	1101	26.54	12/17/97	1201	23.11	12/17/97	1546	00.08
02178T02.TXT	12/16/97	2100	00.00	12/17/97	1115	22.53	02/14/98	2100	23.39	02/14/98	2100	23.39
04018T02.TXT	02/07/98	1800	00.00	02/17/98	1230	22.67	04/01/98	1100	25.11	04/02/98	0845	00.17
05048T02.TXT	03/31/98	1700	00.00	04/01/98	1030	25.53	05/04/98	1245	25.99	05/04/98	1600	00.15
06018T02.TXT	05/04/98	0100	00.00	05/04/98	1200	26.58	06/01/98	1145	25.44	06/01/98	1345	34.60
07098T02.TXT	05/28/98	1300	00.00	06/01/98	1100	28.60	07/09/98	1100	29.14	07/09/98	1545	00.15

Note: 07217T02.TXT depth in ft
09197T02.TXT no salinity
10227T02.TXT no salinity

Table 59
CDT3 Salinity Data Limits and Deployment Information

File Name	Start			Start Good			End Good			End		
	Date	Time	PPT	Date	Time	PPT	Date	Time	PPT	Date	Time	PPT
07037T03.TXT	06/04/97	2000	00.00	06/06/97	1332	37.63	07/02/97	1302	30.97	07/03/97	1517	00.04
07217T03.TXT	07/02/97	0730	00.00	07/02/97	1200	33.94	07/18/97	1315	38.58	07/21/97	0915	00.00
08057T03.TXT	07/18/97	0800	00.00	07/18/97	1130	35.23	08/05/97	1200	32.33	08/05/97	1445	12.06
08277T03.TXT	08/04/97	1430	00.01	08/05/97	1015	35.95	08/27/97	1145	35.37	08/28/97	0800	00.07
09197T03.TXT	08/26/97	1330	00.00	08/27/97	1000	35.47	09/19/97	1115	32.50	09/19/97	1415	00.04
10227T03.TXT	09/18/97	1330	00.00	09/19/97	0945	31.41	10/22/97	1100	30.37	10/22/97	1215	00.11
11197T03.TXT	10/21/97	1500	00.00	10/22/97	0915	31.86	11/19/97	1200	33.54	11/19/97	1415	00.67
12177T03.TXT	11/10/97	1100	00.00	11/19/97	1045	32.73	12/17/97	1230	32.80	12/17/97	1645	19.83
02188T03.TXT	12/15/97	1730	00.00	12/17/97	1045	31.71	01/24/97	0900	33.28	01/24/98	0900	33.28
03278T03.TXT	02/18/98	1045	00.00	02/18/98	1330	33.10	03/27/98	1345	32.29	03/27/98	1445	00.10
04238T03.TXT	03/27/98	1230	00.00	03/27/98	1315	32.79	04/23/98	1430	34.02	04/23/98	1615	00.27
05048T03.TXT	04/22/98	1900	00.00	04/23/98	1415	34.72	05/04/98	1315	34.75	05/04/98	1730	00.11
06018T03.TXT	05/04/98	0100	00.00	05/05/98	1145	35.06	06/01/98	1215	34.60	06/01/98	1500	00.06
07098T03.TXT	05/29/98	1500	00.00	06/01/98	1045	33.70	07/09/98	1115	34.41	07/09/98	1345	00.24
08048T03.TXT	07/06/98	1800	00.00	07/09/98	0930	37.02	08/04/98	1500	34.47	08/05/98	1100	00.10

Note: 07217T03.TXT internal error
No data 01/24/98(0900) – 02/18/98(1330)

Table 60
CDT4 Salinity Data Limits and Deployment Information

File Name	Start			Start Good			End Good			End		
	Date	Time	PPT	Date	Time	PPT	Date	Time	PPT	Date	Time	PPT
07117T04.TXT	06/04/97	1711	00.00	06/06/97	1411	35.84	07/10/97	1156	29.60	07/11/97	1326	00.03
07317T04.TXT	07/08/97	1200	x	07/10/97	1045	x	07/29/97	1415	x	07/31/97	1300	x
08157T04.TXT	07/29/97	0845	x	07/29/97	1145	x	08/15/97	1200	x	08/18/97	0830	x
09107T04.TXT	08/15/97	0815	00.00	08/15/97	1000	32.71	09/10/97	1115	30.22	09/10/97	1400	00.03
10037T04.TXT	09/09/97	1515	00.00	09/10/97	0845	30.10	10/03/97	1000	29.72	10/03/97	1200	00.13
10307T04.TXT	10/02/97	0815	00.00	10/03/97	0900	29.64	10/30/97	1230	32.18	10/31/97	0830	00.07
12087T04.TXT	10/29/97	1315	00.00	10/30/97	1045	32.13	12/08/97	1030	30.18	12/08/97	1245	00.04
01308T04.TXT	01/06/98	0930	00.00	01/07/98	1000	28.71	01/30/97	1300	32.35	02/01/98	1245	00.41
03028T04.TXT	01/29/98	1500	x	01/30/98	1000	x	03/02/98	1500	x	03/03/98	0815	x
04068T04.TXT	02/24/98	1000	00.29	03/02/98	1446	31.07	04/06/98	1616	31.69	04/07/98	0716	35.23
04238T04.TXT	04/06/98	0930	00.00	04/06/98	1115	32.93	04/23/98	1315	35.36	04/23/98	1545	00.11
05248T04.TXT	04/22/98	1900	00.00	04/23/98	1015	35.66	05/24/98	1315	37.84	05/26/98	0745	00.10
07018T04.TXT	05/23/98	1500	00.00	05/24/98	1145	38.02	07/01/98	1245	36.27	07/06/98	1015	00.07

Note: 07317T04.TXT no salinity no DO mg/l
08157T04.TXT no salinity internal error
03028T04.TXT no salinity
04068T04.TXT no DO
No data 12/08/97(1030) – 01/07/98(1015)

Table 61
CDT5 Salinity Data Limits and Deployment Information

File Name	Start			Start Good			End Good			End		
	Date	Time	PPT	Date	Time	PPT	Date	Time	PPT	Date	Time	PPT
07107T05.TXT	06/04/97	2000	00.00	06/06/97	1430	28.26	06/10/97	0515	19.62	06/10/97	0515	19.62
07317T05.TXT	07/09/97	0515	00.00	07/10/97	1315	23.38	07/29/97	1400	21.57	07/31/97	0815	35.52
08157T05.TXT	07/29/97	0845	00.00	07/29/97	1200	22.24	08/15/97	1145	21.75	08/18/97	0730	00.01
09107T05.TXT	08/14/97	1530	00.00	08/15/97	0947	22.12	09/10/97	1102	21.20	09/10/97	1247	00.04
10037T05.TXT	09/09/97	1700	00.00	09/10/97	1000	23.19	10/03/97	1100	22.22	10/03/97	1345	00.07
10307T05.TXT	10/02/97	0930	00.00	10/03/97	0915	22.54	10/30/97	1215	23.36	10/31/97	0900	00.07
12057T05.TXT	10/29/97	1300	x	10/30/97	1030	x	12/05/97	1200	x	12/05/97	1545	X
01298T05.TXT	12/04/97	1630	00.00	12/05/97	1000	18.29	01/29/98	1045	22.38	01/29/98	1230	00.09
02208T05.TXT	01/28/98	1500	00.00	01/29/98	1000	22.55	02/20/98	1245	17.68	02/20/98	1500	00.35
04018T05.TXT	02/20/98	1100	00.00	02/20/98	1230	17.53	03/28/98	0945	20.98	03/28/98	0945	20.98
04298T05.TXT	03/31/98	1700	00.00	04/01/98	1315	11.73	04/29/98	1115	34.09	04/29/98	1400	36.04
05248T05.TXT	04/28/98	1630	00.00	04/29/98	0930	34.20	05/24/98	1300	36.08	05/26/98	0730	00.15
07018T05.TXT	05/23/98	1500	00.00	05/24/98	1226	36.16	07/01/98	1326	33.64	07/06/98	0711	00.09

Note: 12057T05.TXT no salinity
12057T05.TXT internal error 12/02/97 1630
No data 06/10/97(0515) – 07/10/97(1315)

Table 62
CDT6 Salinity Data Limits and Deployment Information

File Name	Start			Start Good			End Good			End		
	Date	Time	PPT	Date	Time	PPT	Date	Time	PPT	Date	Time	PPT
07107T06.TXT	06/04/97	2000	00.00	06/06/97	1500	22.63	07/10/97	1245	23.86	07/11/97	1115	35.38
07317T06.TXT	07/09/97	1545	00.01	07/10/97	1130	23.84	07/29/97	1345	19.93	07/31/97	1245	35.78
08157T06.TXT	07/28/97	1600	00.00	07/29/97	1230	18.67	08/15/97	1130	18.68	08/15/97	1400	00.08
09107T06.TXT	08/14/97	1530	00.00	08/15/97	1015	20.16	09/10/97	1045	18.74	09/10/97	1315	00.05
10037T06.TXT	09/09/97	1545	00.00	09/10/97	0930	18.38	10/03/97	0945	20.99	10/03/97	1130	00.02
10307T06.TXT	10/02/97	0845	00.00	10/03/97	0930	20.35	10/30/97	1200	25.18	10/31/97	0930	00.05
12057T06.TXT	10/29/97	1245	00.00	10/30/97	1100	25.83	12/05/97	1145	23.66	12/05/97	1500	00.11
01298T06.TXT	12/04/97	1700	x	12/05/97	1045	x	01/29/98	1015	x	01/29/98	1059	x
03268T06.TXT	01/28/98	1530	00.00	01/29/98	1000	23.14	03/26/98	1415	20.30	03/26/98	1800	00.16
04298T06.TXT	03/23/98	1330	00.00	03/26/98	1345	21.72	04/29/98	1100	30.94	04/29/98	1145	00.21
05248T06.TXT	04/28/98	1630	00.00	04/29/98	0945	30.69	05/24/98	1245	33.81	05/26/98	0730	36.56
07018T06.TXT	05/23/98	1530	00.00	05/24/98	1230	33.55	07/01/98	1230	33.83	07/06/98	0915	00.18

Note: 01298T06.TXT no salinity

Table 63
CDT7 Salinity Data Limits and Deployment Information

File Name	Start			Start Good			End Good			End		
	Date	Time	PPT	Date	Time	PPT	Date	Time	PPT	Date	Time	PPT
07107T07.TXT	06/06/97	1130	00.00	06/06/97	1515	33.56	07/10/97	1330	41.68	07/10/97	2000	01.27
07317T07.TXT	07/09/97	1600	00.00	07/10/97	1215	29.26	07/29/97	1315	27.02	07/29/97	1315	27.02
10087T07.TXT	09/09/97	1530	00.00	09/10/97	1000	25.30	10/08/97	1315	21.66	10/09/97	1200	35.69
10307T07.TXT	10/06/97	1100	00.04	10/08/97	1145	21.93	10/30/97	1130	27.56	10/31/97	1000	00.09
12057T07.TXT	10/27/97	1315	00.00	10/30/97	1115	27.98	12/05/97	1130	28.26	12/05/97	1400	00.18
02068T07.TXT	12/04/97	1730	00.00	12/05/97	1115	28.59	02/02/98	1130	25.85	02/02/98	1730	25.85
03268T07.TXT	02/02/98	1030	00.00	02/06/98	1015	24.92	03/26/98	0130	26.32	03/26/98	0130	26.32
04298T07.TXT	03/23/98	1400	00.00	03/26/98	1000	26.36	04/29/98	1030	32.58	04/29/98	1230	00.03
05218T07.TXT	04/28/98	1700	00.00	04/29/98	1015	33.02	05/21/98	1030	34.89	05/21/98	1500	00.13
07018T07.TXT	05/20/98	1600	00.00	05/21/98	0845	35.55	07/10/98	1145	35.16	07/06/98	0815	00.10

Note: 07107T07.TXT depth kicked out depth too great range 1-200 FT
No data 07/29/97(1315) – 09/10/97(1000)

Table 64
CDT8 Salinity Data Limits and Deployment Information

File Name	Start			Start Good			End Good			End		
	Date	Time	PPT	Date	Time	PPT	Date	Time	PPT	Date	Time	PPT
07167T08.TXT	06/10/97	1400	00.00	06/12/97	1230	30.95	07/15/97	1515	28.56	07/16/97	1115	00.00
08047T08.TXT	07/14/97	1315	00.08	07/15/97	1400	28.85	08/01/97	1500	30.94	08/04/97	0845	00.03
08217T08.TXT	07/31/97	1615	x	08/01/97	1015	x	08/21/97	1330	x	08/25/97	1345	x
09177T08.TXT	08/19/97	1030	00.00	08/21/97	0930	31.20	09/17/97	1330	26.32	09/17/97	1500	00.08
10087T08.TXT	09/11/97	1315	00.00	09/17/97	0845	26.27	10/08/97	1230	24.35	10/09/97	1125	36.01
11067T08.TXT	10/06/97	1145	00.00	10/08/97	1215	24.00	11/06/97	1430	30.19	11/07/97	1034	00.34
12107T08.TXT	10/31/97	1315	00.00	11/06/97	1045	30.34	12/10/97	1600	29.78	12/12/97	0930	00.04
02068T08.TXT	12/10/97	0845	x	12/10/97	1045	x	02/06/98	1100	x	02/06/98	1345	x
03268T08.TXT	02/01/98	1500	00.00	02/06/98	1045	28.00	03/18/98	1215	27.98	03/18/98	1215	27.98
04218T08.TXT	03/26/98	0900	00.00	03/26/98	1200	26.47	04/21/98	1130	33.22	04/21/98	1530	00.20
05218T08.TXT	04/21/98	0800	00.01	04/21/98	0945	33.85	05/10/98	1415	32.15	05/21/98	1415	00.01
06298T08.TXT	05/20/98	1630	00.00	05/21/98	0900	33.68	06/29/98	1230	35.83	06/30/98	0915	00.03

Note: 08217T08.TXT no salinity
02068T08.TXT no salinity
10087T08.TXT internal error 09/16/97 1415
No data 03/18/98(1215) – 03/26/97(1200)

Table 65
CDT9 Salinity Data Limits and Deployment Information

File Name	Start			Start Good			End Good			End		
	Date	Time	PPT	Date	Time	PPT	Date	Time	PPT	Date	Time	PPT
07167T09.TXT	06/10/97	1400	00.00	06/12/97	1345	34.63	07/15/97	1430	31.74	07/16/97	1251	00.07
08047T09.TXT	07/14/97	1315	00.00	07/15/97	1315	32.14	08/01/97	1430	33.84	08.04/97	0734	00.06
08217T09.TXT	07/31/97	1630	00.00	08/01/97	1045	35.80	08/21/97	1300	35.03	08/25/97	0730	00.07
09177T09.TXT	08/19/97	1100	00.01	08/21/97	0945	35.11	09/17/97	1300	31.14	09/18/97	0730	00.15
10097T09.TXT	09/11/97	1330	00.00	09/17/97	0900	33.34	10/09/97	0945	30.53	10/09/97	1249	00.12
11067T09.TXT	10/06/97	1200	39.17	10/09/97	0930	31.98	11/06/97	1400	34.31	11/07/97	0845	35.96
12107T09.TXT	10/31/97	1300	00.03	11/06/97	1100	34.89	12/10/97	1545	33.82	12/12/97	0815	00.12
01308T09.TXT	12/10/97	0915	00.00	12/10/97	1530	33.69	01/30/98	1200	34.11	02/01/98	1130	00.47
03308T09.TXT	01/29/98	1600	00.00	01/30/98	1030	35.22	03/30/98	1300	33.27	03/30/98	1430	00.53
04218T09.TXT	03/27/98	1145	00.00	03/30/98	1230	34.46	04/21/98	1115	35.55	04/21/98	1430	00.07
05218T09.TXT	04/21/98	0800	00.00	04/21/98	1015	35.86	05/21/98	1000	35.56	05/21/98	1345	00.16
06298T09.TXT	05/20/98	1630	00.00	05/21/98	0930	36.09	06/29/98	1200	35.02	06/30/98	0830	35.20

Note: 05218T09.TXT internal error 04/24/98 0700
01308T09.TXT internal error
07167T09.TXT depth in ft
11067T09.TXT internal error
12107T09.TXT internal error 12/12/97 (0830)

Table 66
CDT10 Salinity Data Limits and Deployment Information

File Name	Start			Start Good			End Good			End		
	Date	Time	PPT	Date	Time	PPT	Date	Time	PPT	Date	Time	PPT
01278T10.TXT	12/15/97	0900	00.00	12/15/97	1300	31.01	01/27/98	1100	31.17	01/28/98	0900	00.02
03198T10.TXT	01/26/98	1630	00.03	01/27/98	1115	34.04	03/19/98	1145	29.02	03/20/98	1300	00.06
04218T10.TXT	03/19/98	0830	00.00	03/19/98	1200	29.13	04/21/98	1030	23.66	04/21/98	1345	00.09
05198T10.TXT	04/20/98	1500	00.00	04/21/98	1045	25.78	05/19/98	1045	32.28	05/19/98	1615	00.50
06258T10.TXT	05/18/98	1900	00.00	05/19/98	1115	32.81	06/25/98	1000	27.01	06/26/98	0845	00.62

Table 67
CDT11 Salinity Data Limits and Deployment Information

File Name	Start			Start Good			End Good			End		
	Date	Time	PPT	Date	Time	PPT	Date	Time	PPT	Date	Time	PPT
08017T11.TXT	07/14/97	1315	00.01	07/15/97	1045	29.34	07/26/97	0942	28.80	07/26/97	0942	28.80
08217T11.TXT	07/31/97	1630	00.01	08/01/97	1230	29.88	08/21/97	1200	31.56	08/25/97	0900	00.21
09177T11.TXT	08/19/97	1215	00.00	08/21/97	1145	32.30	09/17/97	1130	25.43	09/18/97	0915	00.11
10207T11.TXT	09/11/97	1330	00.05	09/17/97	1115	27.32	10/20/97	1230	29.94	10/21/97	0845	00.33
11067T11.TXT	10/20/97	0800	00.00	10/20/97	1215	32.26	11/06/97	1315	33.21	11/07/07	0930	00.03
12127T11.TXT	10/31/97	1345	00.00	11/06/97	1257	32.74	12/03/97	1057	30.82	12/12/97	1358	00.00
03208T11.TXT	01/26/98	1630	00.00	01/27/98	1215	30.41	03/20/98	1100	26.98	03/20/98	1630	35.70
04278T11.TXT	03/17/98	1000	00.00	03/19/98	1245	28.40	04/27/98	1215	32.61	04/27/98	1545	00.15
05198T11.TXT	04/26/98	2230	00.00	04/27/98	1030	33.20	05/19/98	1300	32.19	05/19/98	1530	00.26
06258T11.TXT	05/18/98	1900	00.00	05/19/98	1200	32.02	06/25/98	1230	19.59	06/26/98	0815	29.12
08048T11.TXT	06/24/98	1100	00.00	06/25/98	1100	36.07	08/04/98	0930	25.48	08/05/98	1230	00.51

Note: 08017T11.TXT no depth
08017T11.TXT internal error 07/25/97 2325 07/26/97 0957
12127T11.TXT internal error 12/05/97 1542 12/06/97 0358 12/06/97 1408
12/06/97 1608 12/08/97 1621 12/08/97 1821
12/09/97 0353
No data 12/03/97(1057) – 01/27/98(1215)

Table 68
CDT12 Salinity Data Limits and Deployment Information

File Name	Start			Start Good			End Good			End		
	Date	Time	PPT	Date	Time	PPT	Date	Time	PPT	Date	Time	PPT
07167T12.TXT	06/17/97	1600	00.00	06/18/97	1430	33.12	07/15/97	1300	32.81	07/16/97	1245	00.05
08047T12.TXT	07/14/97	1515	00.00	07/15/97	1145	31.35	08/01/97	1345	32.41	08/04/97	1000	35.22
08217T12.TXT	07/31/97	1700	00.00	08/01/97	1330	33.53	08/21/97	1100	33.98	08/25/97	0930	00.37
09177T12.TXT	08/19/97	1245	x	08/21/97	1045	x	09/17/97	1030	x	09/19/97	0815	x
10207T12.TXT	09/15/97	1530	00.00	09/17/97	1000	34.33	10/20/97	1031	33.05	10/21/97	0746	00.08
11067T12.TXT	10/20/97	0800	00.00	10/20/97	1015	34.79	11/06/97	1215	34.41	11/07/97	1030	00.12
12107T12.TXT	10/31/97	1400	35.81	11/06/97	1200	35.51	12/10/97	1215	31.99	12/12/97	1015	00.26
01278T12.TXT	12/10/97	0915	00.02	12/10/97	1200	33.37	01/27/98	1345	29.77	01/28/98	1000	33.86
03198T12.TXT	01/26/98	1645	00.00	01/27/98	1330	31.27	03/19/98	1345	33.89	03/20/98	1415	00.06
04278T12.TXT	03/17/98	1330	00.00	03/19/98	1330	34.44	04/27/98	1130	32.26	04/27/98	1430	00.37
05198T12.TXT	04/26/98	2300	00.00	04/27/98	1100	35.21	05/19/98	1230	34.90	05/19/98	1500	35.49
06258T12.TXT	05/18/98	1900	00.00	05/19/98	1215	34.91	06/25/98	1145	20.47	06/26/98	0715	01.76

Note: 10207T12.TXT internal error 10/10/97 2145
09177T12.TXT no salinity

Table 69
CTD1 Salinity Calibration Information

Depl No.	Unit ID	Pre-depl Std	Pre-cal Reading	Cal Reading	Cal Temp	Post-depl Std	Post-depl Reading	Post-depl Temp	Δs *	$\Delta s'$ *	$\Delta s''$ *	$\Delta s'''$ *	Note
1	CE4	54.14	53.70	x	x	54.17	54.27	x	.07	-.02	x	x	1
2	97F-0748	54.17	54.16	x	x	54.17	54.16	x	-.01	-.08	x	x	1
3	CE-12	54.17	54.40	54.16	x	54.28	54.19	x	.07	-.01	x	x	1
4	97D0571	54.28	53.47	54.28	x	54.28	54.07	x	-.16	-.17	-.08	.09	
5	CE4	54.28	53.96	54.28	x	54.19	54.28	x	.07	.16	1.57	1.41	
6	CE9	54.19	54.96	54.19	x	54.27	54.14	x	-.10	-.28	-3.45	-3.17	
7	97F0718	54.27	52.14	54.27	19.01	54.27	54.55	19.53	.21	.14	.04	-.1	
8	CE12	54.27	53.50	54.26	18.95	54.51	54.71	19.15	.15	.04	-.14	-.18	
9	97-0162	54.51	54.37	54.50	18.74	53.90	53.88	19.00	-.01	x	x	x	2
10	CE4	53.90	53.93	53.89	18.80	54.18	53.78	19.61	-.30	x	x	.15	3
11	97D-0162	54.18	54.18	54.18	19.75	54.54	54.50	19.53	-.03	-.01	.09	.10	
12	97C-0997	54.54	54.75	54.54	19.36	54.44	54.24	19.55	-.15	-.08	.26	.34	
13	CE-6	54.44	54.70	54.44	20.62	54.50	54.04	19.45	-.34	x	x	x	4

Columns 3, 4, 5, 7, and 8 are specific conductivity in units of mS/cm. Columns 6 and 9 are temperature in °C except where noted otherwise. Information taken or derived from BNP calibration sheets or the data sets. When the post-deployment temperature is unknown, 19° C is assumed for the purposes of calculating Δs.

* Δs = (meter salinity) – (standard salinity) at post-deployment calibration check; $\Delta s'$ = (last CTD salinity reading) – (first CTD salinity reading) when overlap occurs; $\Delta s''$ = (last CTD salinity reading) – (Sea-Bird near bottom reading) when overlap occurs; $\Delta s'''$ = (first CTD salinity reading for replacement meter) – (Sea-Bird near bottom reading) when overlap occurs.

Note:
1. Calibration unclear.
2. Fouled near end of deployment.
3. No salinity data.
4. Power failure raised room temperature at calibration.

Table 70
CTD2 Salinity Calibration Information

Depl No.	Unit ID	Pre-depl Std	Pre-cal Reading	Cal Reading	Cal Temp	Post-depl Std	Post-depl Reading	Post-depl Temp	Δs *	$\Delta s'$ *	$\Delta s''$ *	$\Delta s'''$ *	Note
1	CE8	54.14	53.30	x	x	54.17	54.44	x	.20	-.16	x	x	1
2	97C-0997	54.17	54.17	x	x	54.17	53.75	x	-.31	.21	x	x	1
3	CE-1	54.17	54.50	54.16	x	54.28	53.35	x	-.69	-.32	x	x	
4	97D-0571	54.28	53.87	54.28	x	54.28	53.73	x	-.41	x	-.14	x	
5	CE8	54.28	54.76	54.28	x	54.19	54.23	x	.03	x	x	x	2
6	96L-0743	54.19	55.11	54.19	x	x	54.20	x	x	x	x	3.41	3
7	95J37198	54.27	54.30	54.27	19.08	54.27	53.96	19.54	-.23	-.71	-.34	.37	
8	CE5	54.27	54.19	54.27	18.84	54.51	54.53	19.00	.01	-.47	-.73	-.26	
9	CE6	54.51	54.93	54.51	18.69	53.90	53.49	19.12	-.30	x	x	.27	4
10	CE11	53.90	53.83	53.90	18.74	54.18	53.56	19.11	-.46	-.37	-.47	-.10	
11	CE8	54.18	54.46	54.18	19.74	54.54	54.00	19.42	-.40	-.40	-.47	-.07	
12	97F-0718	54.54	54.38	54.54	19.35	54.44	52.41	19.85	-1.51	-2.78	-.55	.23	
13	CE5	54.44	55.06	54.44	20.51	54.50	53.61	19.47	-.66	x	x	x	5

Columns 3, 4, 5, 7, and 8 are specific conductivity in units of mS/cm. Columns 6 and 9 are temperature in °C except where noted otherwise. Information taken or derived from BNP calibration sheets or the data sets. When the post-deployment temperature is unknown, 19° C is assumed for the purposes of calculating Δs.

* Δs = (meter salinity) – (standard salinity) at post-deployment calibration check; $\Delta s'$ = (last CTD salinity reading) – (first CTD salinity reading) when overlap occurs; $\Delta s''$ = (last CTD salinity reading) – (Sea-Bird near bottom reading) when overlap occurs; $\Delta s'''$ = (first CTD salinity reading for replacement meter) – (Sea-Bird near bottom reading) when overlap occurs.

Note:
1. Calibration unclear.
2. No salinity data.
3. Post-deployment check unclear.
4. Failed near end of deployment.
5. Power failure raised room temperature at calibration.

Table 71
CTD3 Salinity Calibration Information

Depl No.	Unit ID	Pre-depl Std	Pre-cal Reading	Cal Reading	Cal Temp	Post-depl Std	Post-depl Reading	Post-depl Temp	Δs *	$\Delta s'$ *	$\Delta s''$ *	$\Delta s'''$ *	Note
1	97C0797	54.14	53.93	x	x	54.17	54.14	x	-.02	-2.03	x	x	1, 2
2	CE2	58.64	58.64	x	x	54.17	58.45	x	3.21	3.54	x	x	2
3	CE10	54.17	54.69	54.16	x	54.28	53.39	x	-.66	-1.10	x	x	
4	x	x	x	x	x	x	x	x	x	.49	.58	.09	3
5	96G-0959AA	54.28	54.30	54.28	x	54.19	54.05	x	-.10	-.24	-.62	-.38	
6	CE11	54.19	53.63	54.09	x	x	53.96	x	x	-1.2	-1.11	.09	1, 4
7	CE2	54.27	53.71	54.27	19.62	54.27	54.06	19.68	-.16	-.6	-1.23	-.63	
8	CE10	54.27	53.92	54.28	18.87	54.51	54.91	18.91	.30	.27	.44	.17	
9	CE3	54.51	54.24	54.51	19.27	53.90	53.58	19.41	-.24	x	x	.9	5
10	970-0162	53.90	54.22	53.90	19.04	54.19	53.72	19.37	-.35	-1.05	-1.2	-.15	
11	CE13	54.19	54.42	54.19	19.34	54.54	54.12	19.53	-.31	-.67	-.75	-.08	
12	CE2	54.54	54.54	54.54	19.54	54.54	54.64	19.18	.07	-.55	-.35	.2	
13	CE9	54.54	54.53	54.54	19.41	54.44	54.38	19.68	-.04	-.32	-1.8	-1.48	
14	95H-36331	54.44	54.27	54.44	19.67	54.50	52.67	19.49	-1.36	-2.54	x	x	

Columns 3, 4, 5, 7, and 8 are specific conductivity in units of mS/cm. Columns 6 and 9 are temperature in °C except where noted otherwise. Information taken or derived from BNP calibration sheets or the data sets. When the post-deployment temperature is unknown, 19° C is assumed for the purposes of calculating Δs.

* Δs = (meter salinity) – (standard salinity) at post-deployment calibration check; $\Delta s'$ = (last CTD salinity reading) – (first CTD salinity reading) when overlap occurs; $\Delta s''$ = (last CTD salinity reading) – (Sea-Bird near bottom reading) when overlap occurs; $\Delta s'''$ = (first CTD salinity reading for replacement meter) – (Sea-Bird near bottom reading) when overlap occurs.

Note:
1. Unit ID uncertain.
2. Calibration unclear.
3. Log sheet missing for 8/5–8/26/97 deployment.
4. Post-deployment check unclear.
5. Data stopped recording 1/24/98.

Table 72
CTD4 Salinity Calibration Information

Depl No.	Unit ID	Pre-depl Std	Pre-cal Reading	Cal Reading	Cal Temp	Post-depl Std	Post-depl Reading	Post-depl Temp	Δs *	$\Delta s'$ *	$\Delta s''$ *	$\Delta s'''$ *	Note
1	CE6	54.14	53.79	x	x	x	53.53	x	x	x	x	x	1
2	970-0162	54.17	54.18	x	x	54.17	54.48	x	.23	x	x	x	1, 2
3	CE9	54.17	54.64	54.17	x	54.28	54.66	x	.28	x	x	.42	1, 2
4	CE2	54.28	53.90	54.28	x	54.19	53.96	x	-.17	.18	.14	-.04	
5	95J37198	54.19	54.14	54.19	x	54.19	54.32	x	.10	-.4	-.13	.27	
6	97D0162	54.19	54.92	54.19	16.70	54.27	54.47	19.33	.15	.23	.54	.31	
7	CE-13	54.27	56.35	54.27	19.66	54.58	53.40	18.39	-.88	x	-.22	x	
8	97C-0997	54.55	54.49	54.55	19.28	54.66	54.67	19.05	.01	x	x	.51	2, 3
9	CE5	54.66	54.66	54.66	18.97	54.43	54.49	18.70	.04	x	.55	x	
10	96L-0743	54.43	54.69	54.43	17.89	53.90	53.77	17.55	-.10	x	x	-.13	2
11	95J-37198	53.90	54.54	53.90	19.42	54.18	53.33	19.09	-.63	-1.6	-1.4	.2	
12	CE3	54.18	54.02	54.18	19.00	54.54	54.67	19.58	.10	.04	.14	.1	
13	CE6	54.54	54.70	54.53	19.44	54.44	54.69	18.97	.19	-.12	-.23	-.11	
14	95J37198	54.44	109.58	54.44	19.55	54.50	54.10	19.27	-.30	x	-.63	x	

Columns 3, 4, 5, 7, and 8 are specific conductivity in units of mS/cm. Columns 6 and 9 are temperature in °C except where noted otherwise. Information taken or derived from BNP calibration sheets or the data sets. When the post-deployment temperature is unknown, 19° C is assumed for the purposes of calculating Δs.

* Δs = (meter salinity) – (standard salinity) at post-deployment calibration check; $\Delta s'$ = (last CTD salinity reading) – (first CTD salinity reading) when overlap occurs; $\Delta s''$ = (last CTD salinity reading) – (Sea-Bird near bottom reading) when overlap occurs; $\Delta s'''$ = (first CTD salinity reading for replacement meter) – (Sea-Bird near bottom reading) when overlap occurs.

Note:
1. Calibration unclear.
2. No salinity data.
3. Failed immediately.

Table 73
CTD5 Salinity Calibration Information

Depl No.	Unit ID	Pre-depl Std	Pre-cal Reading	Cal Reading	Cal Temp	Post-depl Std	Post-depl Reading	Post-depl Temp	Δs *	$\Delta s'$ *	$\Delta s''$ *	$\Delta s'''$ *	Notes
1	CE7	54.14	53.88	x	x	x	x	x	x	x	x	x	1
2	CE4	54.17	54.17	x	x	x	53.71	x	x	-.01	x	x	2
3	96G0959A6	54.17	56.11	54.17	x	54.28	53.86	x	-.31	-1.09	.4	1.49	
4	97F0718	54.08	54.55	54.27	x	54.19	53.96	x	-.17	.97	1.0	.03	
5	CE5	54.19	54.75	54.18	x	54.19	53.50	x	-.51	-.29	-.26	.03	
6	CE6	54.19	54.00	54.19	18.94	54.27	54.20	19.19	.17	x	.06	x	
7	CE4	54.27	54.24	54.27	19.68	54.55	54.67	19.40	-.26	x	x	-.29	3
8	CE9	54.55	55.12	54.54	18.95	54.43	54.20	18.70	.18	-.12	-.3	-.18	
9	97J0547	54.43	54.59	54.43	19.36	53.90	54.05	19.64	.22	.10	.13	.03	
10	CE3	53.90	54.44	53.90	19.45	54.18	53.89	19.35	-.10	x	x	.43	4
11	CE9	54.18	54.33	54.18	18.62	54.54	54.33	19.27	-.48	-.33	-.11	.22	
12	95H-36331	54.54	54.49	54.54	19.51	54.44	54.48	19.08	-.08	-.04	.0	.04	
13	CE12	54.44	54.65	54.43	19.53	54.50	54.01	19.43	-.02	x	.26	x	5

Columns 3, 4, 5, 7, and 8 are specific conductivity in units of mS/cm. Columns 6 and 9 are temperature in °C except where noted otherwise. Information taken or derived from BNP calibration sheets or the data sets. When the post-deployment temperature is unknown, 19° C is assumed for the purposes of calculating Δs.

* Δs = (meter salinity) – (standard salinity) at post-deployment calibration check; $\Delta s'$ = (last CTD salinity reading) – (first CTD salinity reading) when overlap occurs; $\Delta s''$ = (last CTD salinity reading) – (Sea-Bird near bottom reading) when overlap occurs; $\Delta s'''$ = (first CTD salinity reading for replacement meter) – (Sea-Bird near bottom reading) when overlap occurs.

Note:
1. Six days of data only.
2. Calibration unclear.
3. No salinity data.
4. Data ended just before servicing.
5. Unit on side; float missing when retrieved.

Table 74
CTD6 Salinity Calibration Information

Depl No.	Unit ID	Pre-depl Std	Pre-cal Reading	Cal Reading	Cal Temp	Post-depl Std	Post-depl Reading	Post-depl Temp	Δs *	$\Delta s'$ *	$\Delta s''$ *	$\Delta s'''$ *	Note
1	CE3	54.14	53.97	x	x	54.1	53.65	x	-.33	-.44	x	x	1, 2
2	CE8	54.17	54.17	x	x	54.14	54.11	x	-.02	-.32	x	x	2
3	96L0743	54.17	53.99	54.17	x	54.28	53.88	x	-.30	-.50	1.81	2.31	
4	97C0997	54.28	54.47	54.28	x	54.19	53.33	x	-.64	-.91	-3.30	-2.39	
5	CE12	54.19	54.98	54.19	x	54.19	53.90	x	-.22	.19	-1.61	-1.8	
6	97J0547	54.19	53.57	54.19	17.55	54.27	54.50	19.05	.17	0.0	.64	.64	
7	96G-0959AA	54.27	54.03	54.27	19.72	54.55	54.40	19.12	-.11	x	-1.07	x	
8	96L-0743	54.55	55.60	54.55	17.87	54.43	54.38	17.72	-.04	x	x	-.06	3
9	CE-13	54.43	54.43	54.43	19.19	54.19	54.04	18.91	-.11	-.47	-.21	.26	
10	97C-0997	54.19	54.46	54.19	19.22	54.54	54.10	19.26	-.33	-.66	-.11	.55	
11	CE5	54.54	54.41	54.54	19.60	54.44	55.03	19.14	.44	.40	.45	.05	
12	CE15	54.44	54.71	54.44	19.45	54.50	53.82	19.33	-.51	x	-1.47	x	

Columns 3, 4, 5, 7, and 8 are specific conductivity in units of mS/cm. Columns 6 and 9 are temperature in °C except where noted otherwise. Information taken or derived from BNP calibration sheets or the data sets. When the post-deployment temperature is unknown, 19° C is assumed for the purposes of calculating Δs.

* Δs = (meter salinity) – (standard salinity) at post-deployment calibration check; $\Delta s'$ = (last CTD salinity reading) – (first CTD salinity reading) when overlap occurs; $\Delta s''$ = (last CTD salinity reading) – (Sea-Bird near bottom reading) when overlap occurs; $\Delta s'''$ = (first CTD salinity reading for replacement meter) – (Sea-Bird near bottom reading) when overlap occurs.

Note:
1. Post-deployment standard uncertain.
2. Calibration unclear.
3. No salinity data.

Table 75
CTD7 Salinity Calibration Information

Depl No.	Unit ID	Pre-depl Std	Pre-cal Reading	Cal Reading	Cal Temp	Post-depl Std	Post-depl Reading	Post-depl Temp	Δs *	$\Delta s'$ *	$\Delta s''$ *	$\Delta s'''$ *	Note
1	CE11	53.14	53.44	x	x	54.17	65.15	x	8.32	12.19	x	x	1
2	0959AA	54.17	54.14	x	x	54.17	54.14	x	-.02	x	x	x	1, 2
3	CE11	54.17	53.18	54.16	x	54.28	54.45	x	.13	x	x	x	3
4	96B-46443	54.28	54.44	54.28	x	x	x	x	x	x	x	1.22	3, 4
5	CE10	54.19	54.83	54.19	x	54.27	53.90	x	-.28	-.36	x	x	
6	CE3	54.19	53.98	54.18	19.08	54.27	54.37	19.02	.07	-.38	-.44	-.06	
7	CE-8	54.27	53.94	54.27	19.75	54.55	54.64	19.29	.07	-.31	-.34	-.03	
8	CE-11	54.55	54.66	54.55	18.87	54.19	53.96	18.87	-.17	x	x	-2.88	5
9	CE8	54.19	54.20	54.19	19.10	54.19	53.70	19.24	-.36	x	x	.06	5
10	97F-0718	54.19	54.49	54.19	19.25	54.54	54.00	19.15	-.40	-.46	-.52	-.06	
11	CE15	54.54	53.65	54.54	19.52	54.44	54.52	19.51	.06	-.43	-.22	.21	
12	CE10	54.44	54.29	55.44	19.47	54.50	54.16	19.30	-.28	x	-1.04	x	

Columns 3, 4, 5, 7, and 8 are specific conductivity in units of mS/cm. Columns 6 and 9 are temperature in °C except where noted otherwise. Information taken or derived from BNP calibration sheets or the data sets. When the post-deployment temperature is unknown, 19° C is assumed for the purposes of calculating Δs.

* Δs = (meter salinity) – (standard salinity) at post-deployment calibration check; $\Delta s'$ = (last CTD salinity reading) – (first CTD salinity reading) when overlap occurs; $\Delta s''$ = (last CTD salinity reading) – (Sea-Bird near bottom reading) when overlap occurs; $\Delta s'''$ = (first CTD salinity reading for replacement meter) – (Sea-Bird near bottom reading) when overlap occurs.

Note:
1. Calibration unclear.
2. Failed before retrieval.
3. No salinity data.
4. Unit lost.
5. Data end before retrieval.

Table 76
CTD8 Salinity Calibration Information

Depl No.	Unit ID	Pre-depl Std	Pre-cal Reading	Cal Reading	Cal Temp	Post-depl Std	Post-depl Reading	Post-depl Temp	Δs *	$\Delta s'$ *	$\Delta s''$ *	$\Delta s'''$ *	Note
1	CE1	54.14	55.28	x	x	54.17	53.79	x	-.28	-.27	x	x	1, 2
2	CE6	54.17	54.36	x	x	54.28	53.94	x	-.25	x	x	x	2
3	CE4	58.64	58.62	58.64	x	54.10	54.28	x	.13	x	x	.91	3, 4
4	CE9	54.28	54.93	54.28	x	54.19	54.69	x	.37	.03	.81	.78	
5	97C-0997	54.19	53.66	54.19	x	54.27	54.40	x	.10	.30	.30	0.0	
6	CE12	54.19	54.38	54.17	19.12	54.27	53.18	19.36	-.81	-.24	-.55	-.31	
7	97J-0547	54.27	54.70	54.27	19.37	54.55	54.55	18.82	0.0	x	-.38	x	
8	CE-4	54.58	54.46	54.57	18.58	54.19	54.61	18.92	.31	x	x	3.4	4
9	CE5	54.43	54.76	54.43	19.18	53.19	53.85	19.33	.49	x	x	.07	
10	CE2	54.19	54.27	54.19	19.25	54.54	54.34	19.45	-.15	-.03	.61	.64	
11	96L-0743	54.54	54.66	54.54	17.58	54.44	26.20	66.73	-20.02	x	x	4.78	5, 6
12	CE13	54.44	54.85	54.44	19.40	54.50	54.01	24.91	-.37	x	-.57	x	7

Columns 3, 4, 5, 7, and 8 are specific conductivity in units of mS/cm. Columns 6 and 9 are temperature in °C except where noted otherwise. Information taken or derived from BNP calibration sheets or the data sets. When the post-deployment temperature is unknown, 19° C is assumed for the purposes of calculating Δs.

* Δs = (meter salinity) – (standard salinity) at post-deployment calibration check; $\Delta s'$ = (last CTD salinity reading) – (first CTD salinity reading) when overlap occurs; $\Delta s''$ = (last CTD salinity reading) – (Sea-Bird near bottom reading) when overlap occurs; $\Delta s'''$ = (first CTD salinity reading for replacement meter) – (Sea-Bird near bottom reading) when overlap occurs.

Note:
1. Pre-calibration reading uncertain.
2. Calibration unclear.
3. Post-deployment reading unclear.
4. No salinity data.
5. Data end before retrieval.
6. Post-deployment temperature reported in °F.
7. AC not working in laboratory for post-deployment check.

Table 77
CTD9 Salinity Calibration Information

Depl No.	Unit ID	Pre-depl Std	Pre-cal Reading	Cal Reading	Cal Temp	Post-depl Std	Post-depl Reading	Post-depl Temp	Δs *	$\Delta s'$ *	$\Delta s''$ *	$\Delta s'''$ *	Note
1	CE10	54.14	48.89	x	x	54.17	47.85	x	-4.65	-.40	x	x	1
2	x	x	x	x	x	x	x	x	x	.60	x	x	
3	96G0959AA	54.28	53.75	54.28	x	54.28	54.08	x	-.15	-.02	-.02	0.0	2
4	96G0959AG	54.28	54.92	54.28	x	54.19	54.43	x	.18	-1.15	.19	1.34	
5	97F-0718	54.19	53.93	54.19	x	54.27	53.81	x	-.34	-1.31	-1.07	.24	
6	CE-5	54.19	53.34	54.18	19.20	54.27	53.72	19.30	-.41	-.81	-.89	-.08	
7	CE3	54.27	54.29	54.27	19.65	54.55	53.85	19.08	-.52	-.68	-.08	.6	
8	CE-8	54.58	54.83	54.57	18.82	54.43	53.89	19.08	-.40	-.74	x	.x	
9	CE9	54.43	54.34	54.43	18.91	54.19	53.39	19.62	-.59	-1.1	-.72	.38	
10	CE5	54.19	54.07	54.19	19.22	54.54	54.25	19.59	-.22	.04	.21	.17	
11	CE12	54.54	54.44	54.53	19.24	54.44	54.38	19.47	-.04	-.59	-.72	-.13	
12	CE3	54.44	54.78	54.44	19.40	54.50	53.68	24.85	-.61	x	-.58	x	3

Columns 3, 4, 5, 7, and 8 are specific conductivity in units of mS/cm. Columns 6 and 9 are temperature in °C except where noted otherwise. Information taken or derived from BNP calibration sheets or the data sets. When the post-deployment temperature is unknown, 19° C is assumed for the purposes of calculating Δs.

* Δs = (meter salinity) – (standard salinity) at post-deployment calibration check; $\Delta s'$ = (last CTD salinity reading) – (first CTD salinity reading) when overlap occurs; $\Delta s''$ = (last CTD salinity reading) – (Sea-Bird near bottom reading) when overlap occurs; $\Delta s'''$ = (first CTD salinity reading for replacement meter) – (Sea-Bird near bottom reading) when overlap occurs.

Note:
1. Calibration unclear.
2. No log sheet.
3. AC in laboratory not working for post-deployment check.

Table 78
CTD10 Salinity Calibration Information

Depl No.	Unit ID	Pre-depl Std	Pre-cal Reading	Cal Reading	Cal Temp	Post-depl Std	Post-depl Reading	Post-depl Temp	Δs *	$\Delta s'$ *	$\Delta s''$ *	$\Delta s'''$ *
1	97J-0547	54.55	54.64	54.54	19.37	54.43	54.09	19.16	-.25	-2.87	-2.83	.04
2	97C-0997	54.43	54.78	54.42	18.97	54.19	54.03	19.22	-.12	.31	-.46	-.77
3	CE6	54.19	54.01	54.19	18.36	54.54	54.26	19.49	-.21	-2.12	-7.54	-5.42
4	CE10	54.54	54.65	54.54	19.20	54.44	54.01	19.55	-.32	-.53	-1.12	-.59
5	CE14	54.44	54.27	54.44	19.24	54.50	46.92	19.61	-5.58	x	-9.39	x

Columns 3, 4, 5, 7, and 8 are specific conductivity in units of mS/cm. Columns 6 and 9 are temperature in °C except where noted otherwise. Information taken or derived from BNP calibration sheets or the data sets.

* Δs = (meter salinity) – (standard salinity) at post-deployment calibration check; $\Delta s'$ = (last CTD salinity reading) – (first CTD salinity reading) when overlap occurs; $\Delta s''$ = (last CTD salinity reading) – (Sea-Bird near bottom reading) when overlap occurs; $\Delta s'''$ = (first CTD salinity reading for replacement meter) – (Sea-Bird near bottom reading) when overlap occurs.

Table 79
CTD11 Salinity Calibration Information

Depl No.	Unit ID	Pre-depl Std	Pre-cal Reading	Cal Reading	Cal Temp	Post-depl Std	Post-depl Reading	Post-depl Temp	Δs *	$\Delta s'$ *	$\Delta s''$ *	$\Delta s'''$ *	Note
1	CE5	54.14	53.19	x	x	x	x	x	x	x	x	x	1, 2
2	CE3	54.17	54.24	x	x	x	x	x	x	x	x	x	1, 3
3	CE8	54.28	54.29	54.28	x	54.28	52.98	x	-1.00	-.73	.16	.89	4
4	96L0743	54.28	53.19	54.28	x	51.75	x	x	x	-1.34	-1.77	-.43	
5	CE2	54.19	54.61	54.19	x	54.27	54.49	x	.16	-2.46	-2.46	0.0	
6	CE10	54.27	55.00	54.26	19.07	54.27	54.28	19.29	.01	.41	.41	0.0	
7	CE6	54.27	54.39	54.27	19.30	54.55	54.67	19.87	.09	x	x	x	3, 5
8	96G0959AA	54.58	54.52	54.57	18.11	54.50	54.48	24.40	-.01	x	x	-.09	2, 6, 7
9	97F-0718	54.43	54.84	54.42	19.07	54.19	53.84	19.34	-.26	-.94	-1.02	-.08	
10	95H-36331	54.19	54.09	54.19	18.20	54.54	54.32	19.30	-.16	-.28	.12	.40	
11	CE-3	54.54	54.79	54.55	19.30	54.44	54.15	19.70	-.22	-.39	-.77	-.38	
12	CE-11	54.44	54.95	54.44	19.05	54.50	44.50	19.43	-7.32	-9.72	-9.62	.10	3, 4, 8

Columns 3, 4, 5, 7, and 8 are specific conductivity in units of mS/cm. Columns 6 and 9 are temperature in °C except where noted otherwise. Information taken or derived from BNP calibration sheets or the data sets. When the post-deployment temperature is unknown, 19° C is assumed for the purposes of calculating Δs.

* Δs = (meter salinity) – (standard salinity) at post-deployment calibration check; $\Delta s'$ = (last CTD salinity reading) – (first CTD salinity reading) when overlap occurs; $\Delta s''$ = (last CTD salinity reading) – (Sea-Bird near bottom reading) when overlap occurs; $\Delta s'''$ = (first CTD salinity reading for replacement meter) – (Sea-Bird near bottom reading) when overlap occurs.

Note:
1. Calibration unclear.
2. No salinity data.
3. Data end before retrieval.
4. Heavily fouled.
5. Instrument found adrift.
6. AC not working in laboratory for post-deployment check.
7. Recovered at RSMAS.
8. $\Delta s'$ and $\Delta s''$ calculated with closest meter data point.

Table 80
CTD12 Salinity Calibration Information

Depl No.	Unit ID	Pre-depl Std	Pre-cal Reading	Cal Reading	Cal Temp	Post-depl Std	Post-depl Reading	Post-depl Temp	Δs *	$\Delta s'$ *	$\Delta s''$ *	$\Delta s'''$ *	Note
1	CE12	54.14	54.33	x	x	54.14	53.33	x	-.60	.39	x	x	1, 2
2	96B46443	54.17	54.32	x	x	54.28	53.43	x	-.63	-.80	x	x	1
3	x	x	x	x	x	x	x	x	x	x	-1.22	x	3
4	CE11	54.28	53.90	54.29	x	54.19	54.03	x	-.12	x	x	-.04	4
5	CE13	54.19	53.75	54.19	x	54.27	53.89	x	-.28	-1.85	-1.55	.30	
6	97C0997	54.27	54.02	54.27	19.00	54.27	54.99	19.30	.54	-1.10	-.99	.11	
7	97D-0162	54.27	54.61	54.27	19.34	54.55	53.18	18.68	-1.02	-1.39	-1.81	-.42	
8	CE13	54.58	54.33	54.55	18.12	54.43	51.99	18.95	-1.81	-2.45	-3.73	-1.28	
9	CE-2	54.43	54.69	54.42	19.08	54.19	53.65	19.18	-.40	-.23	-.71	-.48	
10	CE15 98A-0238	54.19	53.32	54.19	18.30	54.54	50.08	19.30	-3.30	-2.62	-2.68	-.06	2
11	CE-13	54.54	54.43	54.55	19.03	54.54	54.04	19.52	-.37	-.31	0.0	.31	
12	97J-0547	54.44	54.05	54.43	19.49	54.50	5.75	19.72	-33.01	x	-13.03	x	2

Columns 3, 4, 5, 7, and 8 are specific conductivity in units of mS/cm. Columns 6 and 9 are temperature in °C except where noted otherwise. Information taken or derived from BNP calibration sheets or the data sets. When the post-deployment temperature is unknown, 19° C is assumed for the purposes of calculating Δs.

* Δs = (meter salinity) – (standard salinity) at post-deployment calibration check; $\Delta s'$ = (last CTD salinity reading) – (first CTD salinity reading) when overlap occurs; $\Delta s''$ = (last CTD salinity reading) – (Sea-Bird near bottom reading) when overlap occurs; $\Delta s'''$ = (first CTD salinity reading for replacement meter) – (Sea-Bird near bottom reading) when overlap occurs.

Note:
1. Calibration unclear.
2. Heavily covered with barnacles.
3. No log sheet.
4. No salinity data.

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14. ABSTRACT

The purpose of this study was to gather field data for Biscayne Bay, Florida, to support the development of a two-dimensional, physical-based numerical model of Biscayne Bay. The data are also appropriate for use in understanding the Biscayne Bay system apart from modeling. The data collection effort was a joint effort by the U.S. Army Engineer Research and Development Center Coastal and Hydraulics Laboratory (CHL) and Biscayne National Park (BNP). Most of the data were collected by BNP, and most of the analysis was done by CHL. The collected data consist of year long sets and Acoustic Doppler Current Profiler intensive inlet transect discharges. Year long data included water surface elevation, temperature, and conductivity values (salinity by calculation) at twelve conductivity, temperature and depth recorders, five additional Acoustic Doppler Profilers to record water surface elevation, temperature, and velocity in 30-cm bins, and one weather station. The intensive transect data included eight to nine approximately hourly transects across 27 inlets and interior channels from which hourly discharge values were calculated. The reliability of the data is considered at length. Additional data necessary for the modeling effort, such as freshwater inflows, were assembled from other sources.

15. SUBJECT TERMS
See reverse.

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Biscayne Bay
Current velocity
Discharge data
Drift index
Field data
Freshwater inflow
Instrument calibration
NGVD29 datum
Numerical modeling
Salinity
Salinity calculation
Temperature
Tide
Water surface elevation
Weather data